Technology's Role in Progress Monitoring Non-Academic IEP Goals

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Dedications

To My Mother
Everything I am, and everything I will ever be,
I owe to your love and support.

To My Former Students
You have been my greatest inspiration.

Acknowledgements

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Abstract

Technology's Role in Progress Monitoring Non-Academic IEP Goals

Alicia M. Drelick

In 1975, a free, appropriate public education was granted for all students regardless of their disabilities. As a result, the special education landscape has constantly been reshaped by new policies and legislation. Progress monitoring calls for the use of data collection to determine the appropriateness of services provided to students with disabilities. The recent Supreme Court ruling in *Endrew F. v. Douglas County SD* warrants giving increased attention to student progress, specifically pertaining to improving functional skills that are addressed outside the general education academic curriculum. While using technology to enhance data collection has become a common practice for measuring academic growth, its application for non-academic individualized education program (IEP) goals is uncertain.

This mixed-methods study examined current practices and rationales for implementing technology-based progress monitoring focused on non-academic IEP goals. Fifty-seven participants responded to an online survey regarding their progress-monitoring programs for non-academic goals. After isolated analysis and interpretation of quantitative and qualitative results, data was synthesized to produce meta-inferences that drew broader conclusions on the topic.

The findings from this study highlight facts impacting the use of technology-based progress monitoring. Furthermore, tools being used for progress monitoring non-academic IEP goals are summarized, along with barriers and benefits to using these tools. Based on these conclusions, recommendations are made to IEP teams, school districts, and software developers

to improve the progress-monitoring process. Further research is suggested to further explore the topic of progress monitoring on non-academic IEP goals.

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Chapter One: Introduction

Introduction to the Problem

Students with disabilities have a tumultuous history within the United States education system. According to the U.S. Department of Education (USDOE; 2010), only one in five students with disabilities attended public school in the 1970s. Many states maintained legislation explicitly excluding students with disabilities, including visual and auditory impairments, emotional disturbances, physical limitations, and intellectual disabilities. Subsequently, many students were institutionalized in restrictive settings where only their basic needs were met. In 1975, Public Law 94-142 was passed, ensuring all students with disabilities access to a free, appropriate public education (FAPE).

New concerns and issues arose, however as a result of the influx of students with disabilities into public education. Legislation addressing these concerns, including the Education for the Handicapped Act (EHA) and the Individuals with Disabilities Education Act (IDEA), was amended to ensure proper educational services were provided for students with disabilities (USDOE, 2010). The IDEA Amendments of 1997 specifically called for the use of progress monitoring during the development of an individualized education program (IEP), as it is integral to determining the appropriateness of services provided to students with special needs (Etscheidt, 2007; Lowrey, Drasgow, Renzaglia, & Chezan, 2007). Furthermore, this revision set a precedent for statewide alternate assessment programs, making schools accountable for the progress of students with more significant disabilities (Lowrey et al., 2007). Overall, this legislation suggests two major themes. First, it introduced the progress-monitoring process of IEP goals, and second, a variety of students with disabilities began to require assessment protocols that differed from traditional means of measuring student learning.

The use of technology to monitor the learning progress of typical students has become common practice due to a rising concern about teacher accountability (Okolo & Smith, 2010). Instructional practices incorporating progress monitoring have gone from nominal teaching approaches to recognized practices, leading to more positive gains in educational outcomes (Zirkel & Thomas, 2010). However, this practice has not carried over into classrooms serving students who are working to achieve progress on non-academic goals, including social, emotional, behavioral, executive functioning, and life skills. Currently, no standardized progress-monitoring protocol implementing technology has been massively adopted to meet the needs of students with disabilities who work to improve non-academic skills, placing the burden of creating, implementing, and maintaining a progress-monitoring program on individual teachers (Goldstein & Behuniak, 2012; Luze & Peterson, 2004).

According to Etscheidt (2006), many judicial decisions regarding students with disabilities have focused on the absence of adequate progress monitoring. Issues include IEP teams' failure to develop a progress-monitoring plan, delegate data-collection responsibilities, use appropriate measures, or collect data frequently enough to reflect student growth (Etscheidt, 2006). With the recent Supreme Court ruling concerning FAPE for students who are "not fully integrated in the regular classroom and not able to achieve on grade level," even more attention is expected to be placed on student progress in non-academic areas, as students' educational programs are expected "to enable a child to make progress appropriate in light of the child's circumstances" (*Endrew F. v. Douglas County SD*, 2017, pp. 14-15). Meller (2011) reports that the special education field has become more reliant on accurate recordkeeping as students with various needs are being served in districts and their progress is assessed in a highly-regulated manner. Lawyers now pounce on data inconsistencies and poor progress-monitoring plans,

costing districts time, resources, and funds. Technological advances over the past two decades have caused a resurgence in hope that technology can solve many problems plaguing special education (Meller, 2011).

Using technology to monitor student learning has become common practice for academic content areas because electronic data allows teachers to make informed instructional decisions. However, this practice has not consistently carried over to classrooms serving students with moderate to severe disabilities who are focused on mastering non-academic and life skills-based goals. Furthermore, research-based strategies to enhance the practice are needed, as there is an increased emphasis on improving student outcomes and teacher effectiveness, as well as concerns regarding "fad interventions" (Cook, 2014, p. 81). Often, documentation providing information on programming, intervention, and student growth are lacking. Currently, a lack of training, resources, and support in this area has led to special education teachers feeling ineffective in the classroom and ill-equipped to teach students with special needs. According to Okolo and Smith (2010), more research is key to providing special education teachers with research-based approaches to increase their success in the field. This new research could help determine the effects of technology in progress monitoring, thereby encouraging its use or reducing pressures to implement a technology-based protocol if deemed ineffective.

Statement of the Problem to be Researched

Electronic data and technology allowing teachers to make informed instructional decisions to monitor student learning have become common tools for academic content areas. However, it is unknown how this practice is currently being implemented in special education classrooms where students focus on functional, non-academic goals.

Purpose and Significance of the Problem

The purpose of this mixed-methods study is to determine the current practices and rationale for implementing a technology-based progress-monitoring plan focused on non-academic IEP goals. While progress monitoring is a legal requirement within an IEP document, IEP teams often have difficulty developing and implementing a legally defensible and effective plan. Yell (2015) asserts that of all the IEP components, progress monitoring is the most out-of-compliance element across the nation. Etscheidt (2006) suggests this lack of meaningful progress monitoring is a contributing factor to many due process proceedings, resulting in school districts being burdened by compensatory education payouts. In the wake of *Endrew F. v. Douglas County* (2017), districts are charged with offering "cogent and responsive explanations for their decisions that show the IEP is reasonably calculated to enable the child to make progress appropriate in light of his circumstances" (p. 16). If school districts fail to respond to this new statute, they can expect more disputes regarding student progress beyond traditional academics.

As technology becomes more ubiquitous in our lives, many programs have been developed to support monitoring progress within academic areas, including reading, mathematics, and science. Some popular tools utilized by school districts include AIMSWeb and Standardized Testing and Reporting (STAR). These programs allow for effective and ongoing progress monitoring and meaningful data collection on academic skills. However, they do not address functional goals, including social, emotional, behavioral, executive functioning, and life skills-based IEP goals. As a result, teachers are left to create their own systems of data collection that may not include current research-based approaches and best practices for non-academic progress monitoring.

When teachers create their own protocols, they often rely on traditional paper methods of collecting data, including checklists, score sheets, or observational notes. This strategy can lead to a great deal of paperwork and increased time focusing on non-instructional tasks. IDEA (2004) specifically called for a reduction in paperwork for special education teachers in its 2004 amendments. Although this regulation was added to IDEA, little support is provided to teachers within the area of progress monitoring on non-academic goals. As Gartin and Murdick (2005) note, a current concern within IDEA 2004 is that it emphasizes monitoring academic goals, and functional goals, or non-academic goals, are often an afterthought within district or school decision-making. The results of this study will provide insight into how teachers are implementing technology-based protocols for progress monitoring on non-academic goals, which can produce a clearer picture of practices utilized in the field. As a result, recommendations can be made concerning implication in the special education field. Moreover, further research can be conducted to examine new best practices that can produce legally defensible and meaningful progress monitoring while addressing the paperwork-reduction clause within IDEA.

Research Questions

1. What are the characteristics of special education teachers who are using or have used technology-enhanced progress-monitoring protocol plans?
    a. Do internal factors significantly impact teachers' use of technology-enhanced progress monitoring on non-academic goals?
    b. Do external factors significantly impact teachers' use of technology-enhanced progress monitoring on non-academic goals?
2. What tools are teachers using to implement technology-based progress-monitoring protocols for non-academic IEP goals?

3. Among teachers who report having used technology-enhanced progress-monitoring protocols, what are their perceptions about the usefulness and ease of using technology-based tools?
4. How do teachers perceive barriers and benefits to using technology for progress monitoring on non-academic IEP goals?

Conceptual Framework

Researcher Stances and Experiential Base

As articulated by Creswell (2013), researchers bring a set of beliefs and philosophical assumptions into their research, whether they are aware of it or not. Often, a researcher's stance affects the guiding questions, research methodology, and interpretation of results. As such, it is imperative for a researcher to disclose these fundamental beliefs to the audience as a means of providing justification for the actions guiding the research. The stances held by the researcher influencing this study include an ontological, postmodernist view interpreted through a disabilities theory lens (see Figure 1.1).

Creswell (2013) defines ontological issues as those that embrace the notion of multiple realities. In this study, the presence of multiple realities was embraced, as the researcher examined individual experiences within progress monitoring on functional goals and technology. Furthermore, the postmodernist viewpoint, which focuses on accessing "multiple perspectives from participants rather than a single reality," employs the use of multiple levels of data collection in order to assist in analysis and interpretation of the research problem (Creswell, 2013, p. 24). As such, this study used a mixed-methods approach, utilizing both quantitative and qualitative measures to provide an in-depth exploration of the problem at hand.

Finally, this research is situated within the realm of disabilities theory and requires the research to be viewed through a disabilities interpretive lens. As Mertens (2003) notes, research with this population has moved away from a medical approach to examining environmental responses and the environments in which individuals with disabilities find themselves. Throughout the data-collection, analysis, and reporting process, the researcher sought to respect the dignity of individuals with disabilities by framing the research toward the service provider. This was done in order to maintain the anonymity of individuals with disabilities while working to provide a meaningful contribution to the special education academic community.

The researcher in this study is a former special education teacher and is currently functioning as an assistive technology professional and education consultant. These experiences are different on the surface, but both have provided the researcher with a great deal of experience within the areas of progress monitoring on functional IEP goals and technology. In addition to practical experience, the researcher has conducted a great deal of theoretical research on this subject matter. As such, the researcher has beliefs about what qualifies as effective progress monitoring on students with disabilities. To mitigate researcher bias, a non-site-specific study was conducted, thus eliminating the potential for data to be collected solely within an area where the researcher has a sphere of influence.

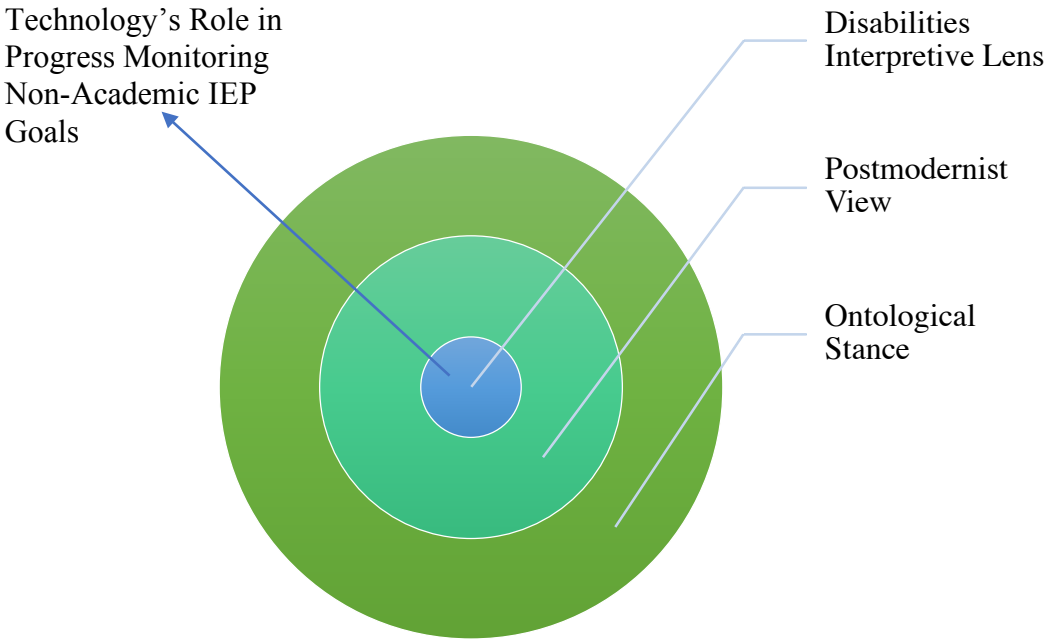

Figure 1.1. A graphic representation of researcher stances.

Conceptual Framework

For the purposes of this research, the following three streams of literature were used to build a conceptual framework: 1) Policy and Regulations Influencing IEP Goals and Progress Monitoring, 2) Current Trends in the Implementation of Progress Monitoring, and 3) Factors Affecting Technology Adoption (see *Figure 1.2*). This conceptual framework provides the reader with contextual background knowledge upon which this research was built. To enact change and promote new practice, a researcher must go beyond the surface event and examine patterns, systems, and mental models affected by an initiative. First, readers will be exposed to special education policy, as well as federal- and state-level regulations influencing an IEP's creation and how its goals are monitored. Next, current trends in the implementation of progress-monitoring protocols, research-based approaches, and factors affecting implementation are explored. Finally,

factors affecting the adoption of new technology are explored in order to identify elements that can hinder or encourage the implementation of new technologies.

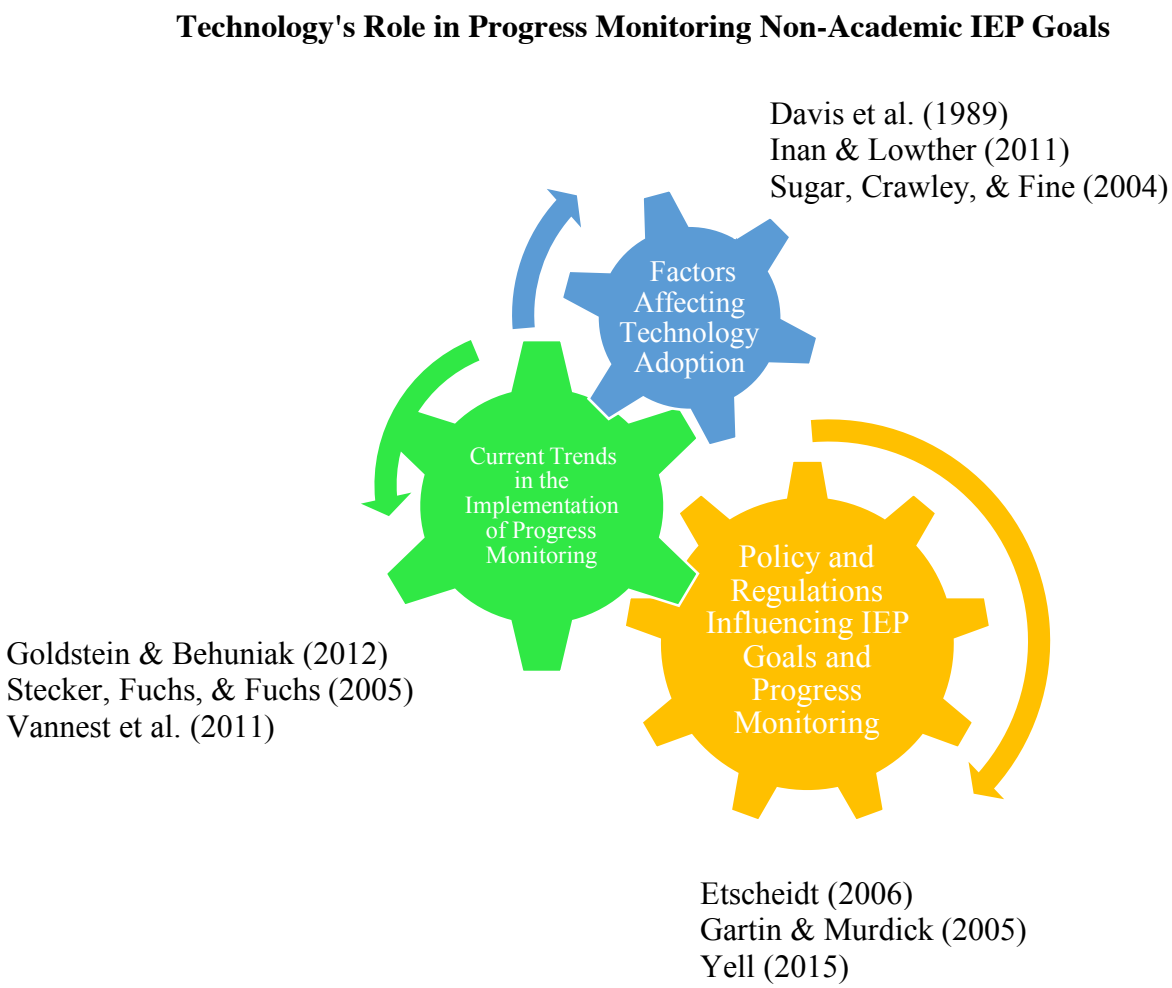

Figure 1.2. Conceptual framework: A visual guide to the three streams of research and seminal authors guiding this research.

Policies and Regulations Affecting IEP Development and Progress Monitoring

IDEA (2004) mandates progress-monitoring plans for each IEP. While this legislation specifically outlines for an IEP team the requirements to be included in a progress-monitoring plan, many educational teams fail to effectively develop and implement this plan. Ultimately, this failure limits or reduces the production of meaningful data and can lead to potential litigation from parents (Etscheidt, 2006). In light of the recent *Endrew F. v. Douglas County School District* (2017) ruling, school districts need guidance on this issue. Without legally defensible progress-monitoring plans, many districts are forced to provide compensatory educational services as a result of not complying with this regulation (Meller, 2011).

Current Trends in Implementation of Progress Monitoring

Progress monitoring is essential to determining the appropriateness of a program or specific interventions for a child with special needs, yet there is a lack of compliance with this legal mandate (Etscheidt, 2006). Teachers are often left to construct their own protocols for individualized life-skills goals with little preparation, training, or feedback. (Goldstein & Behuniak, 2012). A variety of trends emerge during implementation, including frequency of data collection, time spent collecting data, application of data into teaching, communication of data, and reflection of student performance levels.

Factors Affecting Technology Adoption

As Straub (2009) notes, decisions about technology integration are often affected by external factors such as a school or district's resources, even though "it is the individual's' adoption patterns that illustrate a successful implementation" (p. 625). As a result, it is critical to understand both internal and external factors to have a more complete picture of why one individual chooses to adopt a technology-based procedure, while others resist (Straub, 2009).

Hew and Brush (2007) identified five major categories of factors affecting technology integration within K-12 schools, including resources, institution, subject culture, attitudes and beliefs, knowledge and skills, and assessment. Ultimately, it is the interaction of these factors that leads to technology adoption or rejection within the classroom (Straub, 2009).

Definition of Terms

Progress monitoring is an ongoing assessment process in which data is collected to determine student performance levels and the appropriateness of services, instruction, or interventions (Luze & Peterson, 2004).

Functional skills are "those skills that can be used in natural environment/education, home and family, leisure pursuits, community involvement, physical/emotional health, and personal responsibility/relationships" (Wolfe & Harriott 1997, p. 71).

Individualized Education Program (IEP) is a “written statement for each child with a disability that is developed, reviewed, and revised in a meeting in accordance with Sec. 300.320 through 300.324” of the Individuals with Disabilities Education Act (2004, 300.320a).

Technology-based protocols eliminate paper-based data, allow for the collection and organization of data on a virtual platform, and automate tasks that previously required calculations and graphing (Vannest, Burke, Payne, Davis, & Soares, 2011).

Technology adoption refers to the use of desktop computers, laptops, handheld computers, software, smartphones, tablets, or the Internet in K-12 schools for instructional or assessment purposes (Hew & Brush, 2007).

Assumptions, Limitations, and Delimitations

Assumptions

Having worked in the field of special education and technology, the researcher has included certain educated assumptions in the study. Three major assumptions underlie this study's methodology. The first assumption is that progress monitoring is paramount to student success. Its importance reaches beyond the legal mandate to implement the practices, as noted by Fuchs and Fuchs (2001), who state that progress monitoring can "identify students in need of additional or different forms of instruction, to design stronger instructional programs, and to effect better achievement outcomes for their students" (p. 6).

The second assumption underlying the research is the potential for technology tools to enhance the monitoring of student learning. As technology continues to advance and become more ubiquitous in the lives of teachers and students, timely and accurate data can be collected to improve student learning outcomes. Finally, this research assumes that outside factors, including limited availability of resources, teacher education, administrative support, and a district's socio-economic status can influence technology adoption in the classroom. These three assumptions collectively reflect mental models held by the researcher. Furthermore, they also reflect the motivation to engage in this mixed-methods study.

Limitations

Limitations are issues outside the researcher's control that can influence the study's outcome. In this study, several notable limitations should be highlighted to better inform the audience at large. First, this study explores a novel topic in which previous tools assessing teacher implementation of technology-based progress monitoring have not been developed or well-vetted by the academic community. As such, a survey was developed to understand teacher

practices, tools being used to monitor progress toward functional goals, and teacher perspectives. In order to increase the measure's validity, subject-matter experts (SMEs) and a survey research expert provided review and feedback to revise the survey and ensure that questions posed to participants measured the aspects outlined in the study's goals.

As Cui (2003) notes, survey research is prone to four limitations. First, a coverage error can occur if the sample population is not fully representative of the target population. To increase access to the target population, the researcher utilized social media to gain access to special education teachers within and beyond the study's geographical region. Participants were also obtained through direct contact with school districts through email. It is important to note the means of soliciting participants through technology-based tools such as email, social and media, as this may have resulted in a coverage error as participants likely to engage with technology tools are more likely to participate in an online survey.

Moreover, sampling errors are common in this type of research, as responses are not obtained from all members of the target population. When the sample population differs from the target population, a sampling error results (Cui, 2003). To determine the potential level of sampling error in this study, demographic information was collected from participants, and the results were compared to national statistics of special education teachers. If a large sample size made of participants who were demographically similar to the population of interest were not recruited, the study's findings would produce limited generalizability across the total population. As a result, further research may need to be conducted with a larger sample size to confirm the reliability of these results and increase the potential for these results to be generalized.

Thirdly, a measurement error can occur when the element to be measured differs from the actual value, which could occur due to misconceptions or the desire to give socially expected responses (Cui, 2003). Like many surveys, this study relied on self-reporting. As Donaldson and Grant-Vallone (2002) note, "in surveys pertaining to job performance participants tend to under-report behaviors deemed inappropriate by researchers or other observers, and they tend to over-report behaviors viewed as appropriate" (p. 247). This factor could influence the study's validity if participants were not factual in their reporting. To encourage more honest and reflective responses, surveys were taken anonymously and a statement ensuring anonymity was provided before participants accessed the online questionnaire.

Finally, non-response errors occur when an insufficient proportion of the sample population completes the protocol resulting (Cui, 2003). Due to this study's time constraints, the sample size was confined to the number of participants accessed during a three-week window. To increase the response rate for this study, an online format was implemented allowing the participants to complete the questions at their leisure. Additionally, reminders were provided throughout the data-collection window to encourage participant responses.

Delimitations

In light of these limitations, the researcher made conscious decisions, or delimitations, in order to set boundaries and increase the value of the study's results. First, this study was non-site-specific to increase the access to a diverse group of participants. It is crucial to assess participants from districts that vary in socioeconomic status, location, and teacher populations in order to assess demographics that affect the implementation of a technology-based progress-monitoring protocol. Subsequently, a non-site-specific design allowed the researcher to access a

sample population that was more representative of the total population of special education teachers nationwide. The study was primarily focused in the northeast region of the U.S.

Furthermore, this research was constructed as a concurrent mixed-methods study. Thus, both quantitative and qualitative data were collected simultaneously. As this topic is currently in primitive stages of exploration, it was imperative to gather both quantitative and qualitative perspectives from participants to understand more completely the current state of practice implementing technology-based progress monitoring on functional goals. To do this in an effective and efficient manner, a survey containing both quantitative and qualitative probes was provided to all participants. Subsequently, conclusions were drawn reflecting on both types of data from the sample to provide a more holistic picture of the topic under study.

Summary

Progress monitoring has been mandated for students with special needs for almost two decades. Advancements in technology have awarded educators the tools to enhance data collection, analysis, and presentation. While data-driven technology tools are implemented in general education classrooms and with students with mild disabilities in academic areas, these practices have not experienced mass adoption in classrooms focused on addressing functional IEP goals. To enact change while promoting the use of technology to enhance progress monitoring, this study examined technology's effects on teacher behavior and perspectives concerning progress monitoring non-academic IEP goals. The results of this study can play a significant role for students, teachers, administrators, and school districts. Short-term benefits may include better documentation of student growth, allowing teachers to make more informed instructional decisions. Subsequently, long-term effects would improve district-wide data collection, potentially reducing the number of due process cases presented to the district.

Chapter Two: Literature Review

Introduction

Using technology to monitor student learning has become common practice for academic content areas, as electronic data allows teachers to make informed instructional decisions. However, this practice has not consistently carried over into functional, non-academic domains. Technology-enhanced progress monitoring is merely the tip of the iceberg. Below the surface lies a complex system of factors reinforcing behavior and preventing change. In order to address this complex problem, an understanding of practices that are currently being implemented in the field is necessary. The purpose of this mixed-methods study was to determine how behavioral practices and systematic approaches to technology enhance progress monitoring on functional IEP goals.

This section summarizes current literature to support the academic community in understanding the need for further research. First, current regulations, court rulings, and special education policies regarding the development of IEPs and progress-monitoring programs are outlined. Then, readers are exposed to current practices within the field and teacher perceptions of these practices. Finally, barriers to technology adoption are explored to determine perviously identified hindrances to utilizing practices with technology.

This conceptual framework provides the reader with contextual background knowledge upon which the present study was built. To enact change and promote a new practice, a researcher must go beyond the surface event and examine patterns, systems, and mental models affected by an initiative. First, readers are exposed to special education policy, as well as federal- and state-level regulations influencing the creation of IEPs and strategies for monitoring them. Next, teacher beliefs surrounding the use of progress monitoring, regulations surrounding

this practice, and the role of progress monitoring in promoting student growth are explored. Finally, factors affecting the adoption of new technology are explored to identify elements that can hinder or encourage the implementation of new technologies.

Technology's Role in Progress Monitoring Non-Academic IEP Goals

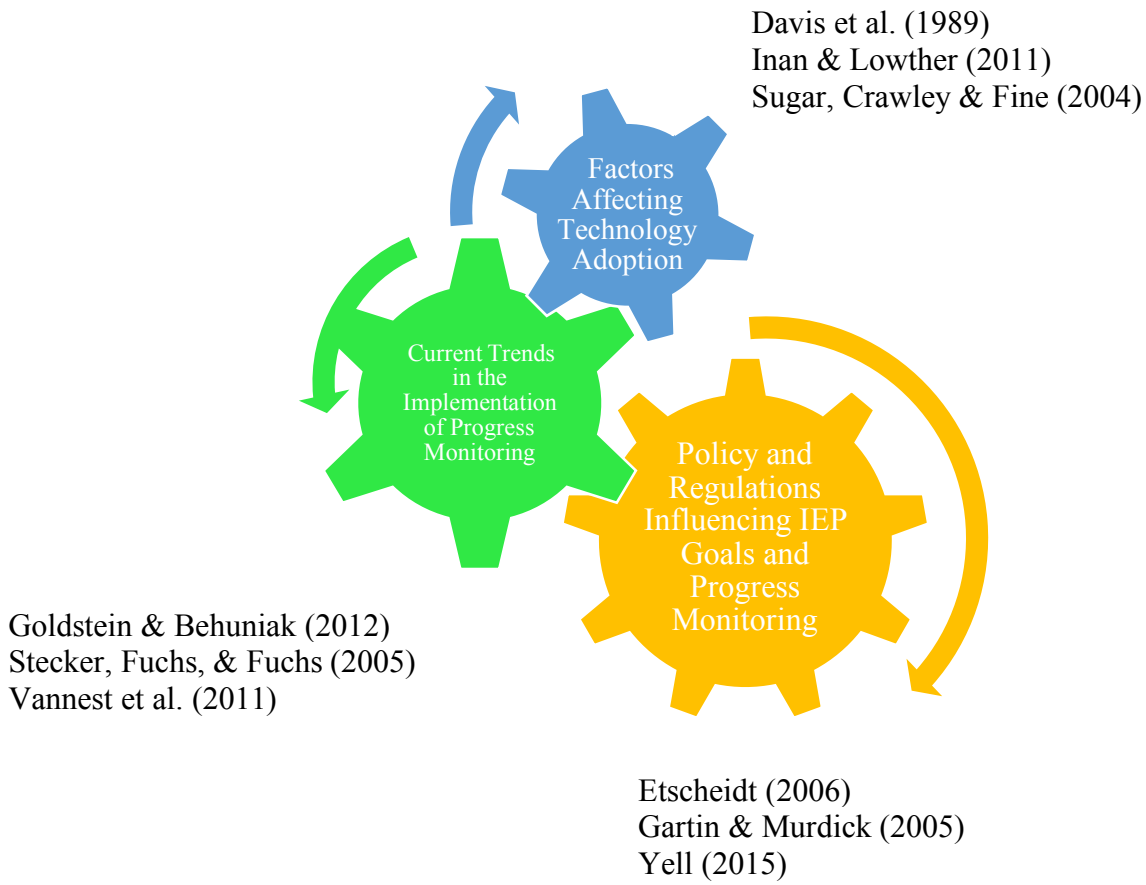

Figure 2.1. A visual guide to the three streams of research and seminal authors guiding this research.

Regulations and Special-Education Policies Concerning the Development of IEP Goals and Progress-Monitoring Programs

Since the inception of Public Law 94-142 in 1975, all students, despite their disabilities were afforded the opportunity to attend a publicly funded school and receive free, appropriate public education (FAPE) (U.S. Department of Education, 2010). Since PL 94-142's passage in

1975, local, state, and federal education systems have been working to define and effectively implement appropriate programs for students with disabilities. Previous standards concerning FAPE and student progress were established in the Supreme Court ruling of *Hendrick Hudson Dist. Bd. of Ed. v. Rowley* (1982), which asserted the need for educational programs that are "reasonably calculated to enable the child to receive educational benefits" (p. 5). This ruling reaffirmed IDEA's role in guaranteeing an adequate and individualized program for students with disabilities. By nature, this case focused on students who could access the general education curriculum. It did not, however, establish a precedent for *how* those students would primarily receive services and instruction outside the general education setting, focusing on improving functional skills. Rather, it set a stand for children whose achievement can be measured by traditional progression through academic grades.

In the recent Supreme Court ruling, *Endrew F. v. Douglas County School District* (2017), the Court addressed adequate programming and progress as they relate to FAPE concerning students primarily, but not fully, integrated into the general education classroom. This ruling established a statute that contends students outside the general education classroom should be expected to make "more than *de minimis* progress" (p. 14). Furthermore, the ruling further acknowledges the need for individualization for these students, stating, "The goals may differ, but every child should have the chance to meet challenging objectives" (*Endrew F. v. Douglas County School District*, 2017, p. 3).

While this ruling set new a precedent surrounding student progress in functional areas, it does not provide a standard or define appropriate progress. The Court, in turn, confirms the IEP team's responsibility to determine appropriate programming and individualized goals. Subsequently, the IEP team must monitor the appropriateness of the programming and assess

overall student progress. As a consequence, districts must prepare to meet this standard in order to provide FAPE for students with disabilities. Moving forward, the Court provided the following guidelines for school districts to address future disputes:

> By the time any dispute reaches court, school authorities will have had complete opportunity to bring their expertise and judgment to bear on areas of disagreement. A reviewing court may fairly expect those authorities to be able to offer a cogent and responsive explanation for their decisions that shows the IEP is reasonably calculated to enable the child to make progress appropriate in light of his circumstances. (*Endrew F. v. Douglas County School District*, 2017, p. 16)

The following subsections summarize current policies and literature reflecting provisions put in place to ensure FAPE is provided to students with disabilities through an IEP.

Individualized Education Program Goals

IDEA (2004) defines an IEP as "a written statement for each child with a disability that is developed, reviewed, and revised in a meeting in accordance with Sec. 300.320 through 300.324" (para. 1). Additionally, this federal regulation outlines the following elements to be in the document: present levels of performance concerning academic achievement and functional performance; measurable annual goals addressing both academic and functional skills; progress-monitoring program; related services, modifications, and accommodations; an explanation of the child's participation level with non-disabled peers; considerations for state assessments; and projected dates for beginning and delivering services (IDEA, 2004).

These requirements call for both academic and functional, or non-academic, goals, including performance-based skills. Wright and Wright (2014) define functional goals as those that help a child engage in routine daily living skills. IDEA (2004) further states that measurable IEP goals must

> a) Meet the child's needs that result from the child's disability to enable the child to be involved in and make progress in the general education curriculum; and (b) Meet each of the child's other educational needs that result from the child's disability (p. 30).

Gartin and Murdick (2005) also indicate that the 2004 IDEA Amendments specify the need for goals that address both academic and functional outcomes. Prior versions of this law did not include these two categories. This change reaffirms an educational system's obligation to address the needs of students with disabilities beyond the general curriculum, including social, emotional, behavioral, and life skills that promote independence.

Both academic and functional goals must be based on students' present levels of academic achievement and functional performance (PLAAFP) (Yell, 2011). Moreover, these goals must be constructed in a manner yielding both specific and measurable objectives. As demonstrated in *Carter v. Florence County School District Four* (1991), goals must be written in a manner that makes assessment and demonstration of mastery obtainable. As such, vague statements such as "student will demonstrate improvement" or "student will improve" are not appropriate for an IEP, as these statements are not observable or measureable.

In addition to annual goals, IDEA (2004) recommends short-term objectives for students who participate in the state alternate assessment program. These objectives replace academic benchmark assessments focused on grade-level academic improvement. Yell (2011) argues that the purpose of these measurable annual goals and objectives is to help determine if a student is making progress and can be consulted when making programming decisions.

Progress monitoring. The law also demands the inclusion of a progress-monitoring plan in each child's IEP. As Gartin and Murdick (2005) note, "This component also includes the discussion of when this progress will be reported (e.g., through quarterly reports or other periodic reports) and is tied to the child's meeting of the annual goals" (p. 328). Prior to this revision, the IEP simply included a statement addressing the extent of progress expected by the end of the year for a child (Gartin & Murdick, 2005). It is evident that progress monitoring is a

mandated practice; however, many IEP teams fail to develop and implement a progress-monitoring plan (Etscheidt, 2006).

Yell (2011) articulates that ongoing progress monitoring is essential for evaluating the appropriateness of a child's educational program, yet there is less compliance with this IEP requirement than any other. Etscheidt (2006) further states that IEP teams consistently fail to produce meaningful data when implementing current progress-monitoring practices. According to Etscheidt (2006), many judicial decisions regarding students with disabilities have focused on the absence of adequate progress monitoring. Issues that arise include an IEP team failing to develop a progress-monitoring plan, undelegated responsibilities for data collection, a team using inappropriate measures, or data not being collected frequently enough to reflect student growth (Etscheidt, 2006). Meller (2011) reports that the special education field has become more reliant on accurate recordkeeping, as students with various needs are being served in districts and their progress is assessed in a highly-regulated manner. Lawyers now pounce on mistakes, costing districts time, resources, and funds. Furthermore, when specifically addressing functional domains, "there is a concern that the reporting requirement will influence the selection of goals by emphasizing academic skills to the exclusion of functional skills," as reporting on academic progress is heavily emphasized in state and federal legislation (Gartin & Murdick, 2005, p. 328). Fortunately, technological advances over the past two decades have caused a resurgence in hope that technology will solve many problems plaguing special education (Meller, 2011).

Parker, Vannest, Davis, and Clemens (2012) address districts' concerns in producing defensible progress monitoring that can provide reliable data for high-stakes decision-making, such as long-term educational placements within the least restrictive setting. Parker et al. (2012) outline considerations that include understanding the reliability of probes used to measure

progress. Specifically, concerns can arise if various forms of a probe are used over time, as teacher-made assessments may not have been evaluated for alternate-form reliability. Furthermore, standardization of probes is crucial, as they display a true depiction of growth or recession within a particular skill set (Parket et al., 2012). Yell (2011) firmly asserts that anecdotal notes alone do not suffice for a progress-monitoring program, as they are subjective and biased. In a recent court case, *County School Board of Henrico County, Virginia v. R.T.* (2006) rulings determined that the student, R.T., had been denied FAPE because there was no meaningful progress monitoring. While a wealth of anecdotal notes concerning the student's progress was present, no systematic approach to data collection was used to measure R.T.'s progress. Like many students with more complex needs, traditional forms of assessment were not appropriate to measure R.T.'s growth and progress. Ultimately, a formalized data-collection system is required to measure and demonstrate student achievement on annual IEP goals.

Alternative assessment. Participation in state and local alternative assessments should also be considered when developing measurable goals and a progress-monitoring plan for an IEP. . It is critical to gain an understanding of alternate assessments for student achievement, as these policies and assessment protocols highlight the need to measure progress of students with disabilities. Title I - Improving the Academic Achievement of the Disadvantaged (2003) clarified how students are to be assessed by aligning assessment tasks to grade-level standards in the areas of language arts, mathematics, and science (Hager & Slocum, 2011). Furthermore, the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 allowed for a more differentiated approach to alternate assessment by addressing the need for modified standards (Hager & Slocum, 2011).

According to Lowery et al. (2007), states use a variety of methods in their alternate assessment programs, including portfolios, body-of-evidence approaches, IEP goal analysis, and checklists for demonstration of tasks. Various states allow local entities to determine appropriate means of assessment. Lowery et al. (2007) define alternate assessment as a tool to measure the learning of students who are unable to respond to the format or content of traditional statewide assessments. Furthermore, "alternate assessment allows for different modes of responding, a different context of assessment, and different content that is still linked to statewide standards" (Lowery et al., 2007, p. 245). Often these assessments expand on statewide standards and include functional, task-based skills addressing life skills that promote independence.

It is vital to understand the alternate assessment program and curricula, as they are directly linked. If a student qualifies for an alternate assessment program, it can be assumed that a more individualized curriculum is needed to meet the needs of that student, focusing on skills related to instructional targets (Lowery et al. 2007). As Hager and Slocom (2011) suggest, teachers should create data-collection systems to measure student progress towards assessed tasks to help students make meaningful progress in key focus areas. However, without standardized protocols, teachers develop their own methods and practices to monitor progress with little preparation, training, or feedback. (Goldstein & Behuniak, 2012). As Stockall, Dennis, and Rueter (2014) note, this strategy yields a record system lacking in continuity as a child transitions through the educational program, affecting his or her overall potential for growth.

IDEA (2004) outlines an overall synopsis of each of the above federal requirements within an IEP. While progress monitoring is a legally mandated element within special education, IEP teams often struggle to develop and implement an effective plan (Etscheidt, 2006; Yell, 2011). Furthermore, the current focus on academic testing and teacher accountability has

led functional IEP goals to be an afterthought for teachers of students with disabilities (Gartin & Murdick, 2005). Due to this neglect, little research exists examining progress-monitoring protocols for measuring student achievement in functional areas, including social, emotional, behavioral, and life skills that promote independence.

Current Trends in the Implementation of Progress Monitoring

The use of technology to monitor the learning progress of typical students has become common practice due to a rising concern about teacher accountability (Okolo & Smith, 2010). Instructional practices incorporating progress monitoring have gone from nominal teaching approaches to recognized practices, leading to more positive gains in educational outcomes (Zirkel & Thomas, 2010). However, this practice has not carried over into non-academic domains. Currently, no standardized progress-monitoring protocol implementing technology has been massively adopted to meet the needs of students with disabilities focused on increasing non-academic skills, which places the burden of creating, implementing, and maintaining a progress-monitoring program on individual teachers (Goldstein & Behuniak, 2012; Luze & Peterson, 2004).

The IDEA Amendments of 1997 first mandated a progress-monitoring plan as part of the IEP process. States have continued to stress the importance of progress monitoring by establishing regulations regarding response to intervention (RTI) (Zirkel & Thomas, 2010). RTI is an instructional model involving universal screening, ongoing progress monitoring on student learning, use of evidence-based practices, and use of technology as a tool for synthesizing data in order to make informed instructional decisions (Okolo & Smith, 2010). Zirkel & Thomas (2010) indicate that 47 U.S. states have developed expectations for implementing RTI with both general and special education students. This practice has moved from a phenomenal approach to one of

mass adoption (Zirkel & Thoman, 2010). Although RTI was initially developed to address special education mandates, large-scale adoption focuses on all students, including general education, at-risk, and special education students.

The goal of RTI is to improve the educational outcome for all students; however, RTI fails to address the functional needs of students with moderate to severe disabilities (Okolo & Smith, 2010). Despite this limitation, multiple studies have highlighted teachers' desire to effectively and efficiently collect data to assist their students with significant disabilities in making meaningful progress while complying with federal law (Etscheidt, 2006; Loete, 2014; Luckner & Bowen, 2010; Zhang, Wang, Losinki & Katsiyannis, 2014). Notwithstanding, a large number of IEP teams fail to design or implement these plans, resulting in a denial of appropriate special education services (Etscheidt, 2006).

Many teachers resort to creating their own forms, charts, and graphs to collect data in order to monitor their students' progress without linking the process to instruction or determine appropriate interventions (Luze & Peterson, 2004). Luckner and Bowen (2010) surveyed 22 educators working with hearing-impaired students on the materials they used to conduct progress monitoring. Commercial probes and other materials, including websites, were noted; however, teachers overwhelmingly responded that they utilized teacher-made materials (Luckner & Bowen, 2010).

Systematic Structures Influencing Trends in Progress Monitoring

Peacock, Ervin, Daly, and Merrell (2010) identify key elements to be included in the progress-monitoring process for students with significant disabilities. These features include frequent and ongoing probes, the ability to track the student's performance at his or her level of independence, and providing summative data through the use of charts or graphs connecting

progress monitoring to instruction. The next sections review current literature on evidence-based practices, specifically for students with moderate to severe disabilities, teachers' adoption of technology, and administrator influence.

Evidence-Based Practices

Evidence-based practices are needed to close the research-to-practice gap; nevertheless, these practices are often limited and do not address all teachers' instructional needs (Cook, 2014). Cook and Cook (2013) define evidence-based practice as an instructional technique "that meets prescribed criteria related to the research design, quality, quantity, and effect size of supporting research, which have the potential to help bridge the research-to-practice gap and improve student outcomes" (p. 71). These criteria allow a technique to be well-vetted, yielding a greater likelihood of success if implemented. Reforms in developing evidence-based practices shed light on the importance of instructional programs and practices that have prove effective by credible evidence, align with stakeholder values, and address instructors' practical needs (Cook, 2014).

It is crucial for progress monitoring on students with disabilities to be individualized and ongoing due to the diverse needs and skills of students with moderate to severe disabilities. A variety of multidimensional goals and instructional strategies must be employed during instruction. As demonstrated in a recent study involving 11 students focused on improving performance on life-skills tasks, individualized measures can yield positive results while addressing systemic failures that occurred in previous life-skills evaluations (Di Rezze, Wright, Curran, Campbell, & Macarthur, 2008). Di Rezze et al. (2008) assert that continuous progress monitoring, including establishing a baseline prior to instruction, is critical to maximize the impact of instruction (Stecker, Fuchs, & Fuchs, 2005). Ongoing assessment helps ensure that

interventions and instructional strategies are effective and appropriate (Luze & Peterson, 2004). Huberman, Navo, and Parrish (2012) further suggest school districts that excel in serving students with disabilities use individualized, ongoing assessment as a strategy.

Preserving the authenticity of progress monitoring is another paramount practice that should be considered to ensure the integrity of data collected (Deno, 2003). Deno (2003) suggests building progress-monitoring portfolios that contain work samples, pictures, or videos of completed tasks, and that provide a collection of artifacts validating data. As Stockall et al. (2014) make evident, portfolio-based progress monitoring is an effective way to illustrate student growth, depict mastery, and establish consistency in teacher expectations. Along with technology to collect and store artifacts, this practice has become more efficient and accessible to educators (Stockall et al., 2014).

An exorbitant amount of data is produced with the implementation of individualized, ongoing assessment supported by authentic artifacts. The development of data-collection and analysis skills to manage massive assessment data is linked to effective teaching, which leads to student growth (Heritage & Chen, 2005). These skills are also crucial to producing defensible progress monitoring. Teachers need a foundation in statistical analysis, an understanding of reliability concepts, the ability to measure rates of improvement while noting errors, and skills in data-informed decision-making in order to implement an effective progress-monitoring plan (Parker et al., 2012). Although important tools to improve progress monitoring, these skills are not common among educators. Heritage and Chen (2005) suggest professional development as a means for improving these skills.

Evidence-based practices linking progress monitoring to instruction. As the RTI model demonstrates, a well-established progress-monitoring protocol becomes part of the

instructional routine, as it informs teachers of an intervention's ongoing effectiveness (Stecker et al., 2005). Instructional techniques, specifically those that target the needs of students with moderate to severe disabilities, can be built into the progress-monitoring process, making instruction and data collection seamless. These techniques include using a task analysis, chaining instruction, and system of least prompts.

Task-analytic instruction breaks a task into a set of manageable steps and then teaches each step in sequence (Wakeman, Karvonen, & Ahumada, 2013). Due to its flexible and customizable nature, a task analysis can benefit both teachers and students. Miller and Taber-Doughty (2014) provide evidence of students with intellectual disabilities mastering skills through the use of self-monitoring, step-by-step checklists during guided-science inquiry instruction in a general education classroom.

In order to use a task analysis to teach new life skills, such as washing hands or using a vending machine, to students with moderate to severe disabilities, Wakeman et al. (2013) recommend using backward or forward chaining instruction. In forward chaining, students learn to master the first step in a task analysis in order to complete a task, while a teacher supports the remaining steps. Students can also start by mastering the final step in a sequence and build as supports are released during each probe. These instructional strategies ensure strong learning outcomes through targeted support.

Prompts are used to support student progress throughout chaining instruction. In the system of least prompts strategy, a hierarchy of prompting is established and systemically delivered (Ault & Griffin, 2013). It is crucial for teachers to be mindful of fading prompts as students progress in order to prompt mastery and independence. By including the types and frequency of prompts, instructors can more accurately detect progress for task-based goals as

compared to more traditional forms of progress monitoring (Ault & Griffin, 2013). Luze and Peterson (2004) explain that it can be difficult to incorporate numerous evidence-based practices into a progress-monitoring protocol, especially when the responsibility for development lies with individual teachers. This process could become less strenuous if technology is incorporated. Technology allows teachers to spend less time monitoring student progress, analyzing data, and summarizing results, and more time teaching (Vannest et al., 2011).

Technological advances over the past two decades have led to a resurgence in hope that digital resources will solve many problems plaguing special education (Meller, 2011). Yet, Okolo & Smith (2010) suggest these tools are underutilized in special education, especially among students who would benefit most from their use. Like using technology in RTI, incorporating technology into progress monitoring on life-skills goals could yield positive results. This process has the potential to become more time efficient, inform instructional practices by providing detailed feedback, build a body of definable data, and increase communication between teachers, parents, and school administrators.

The high demands placed on special education teachers by legislation, including IDEA, can become more manageable through the use of technology (Vannest et al., 2011). Digital tools allow for resource sharing, improved storage, individualization, and collaboration, in turn allowing educators to take a more active role in their students' development (Konstantinidis, Theodosiadou, & Pappos, 2013). Moreover, technology allows for the automatization of complex skills involving data synthesis because it produces detailed tables and graphs that would not otherwise be possible (Bausch & Ault, 2013).

It is evident that a variety of different methods is utilized to monitor the progress of students with IEPs. Federal and state initiatives to implement RTI models have increased the use

of systematic progress monitoring protocols for academic goals (Stecker et al., 2005). Research-based practices have been established in the area of progress monitoring on functional IEP goals, and technology advancements have provided teachers with the opportunity to improve traditional means of collecting data (Bausch & Ault, 2013; Cook, 2013; Peacock et al., 2010; Vannest et al., 2011). However, it is unknown how or if these methods are being utilized in classrooms where students' non-academic needs are addressed.

Factors Affecting the Adoption of New Technology

Technology provides enormous opportunities for both teaching and learning, yet its application in education is still underdeveloped. As Konstantinidis et al. (2013) note, it is no longer possible for teachers to ignore technological advances; however, they are still reluctant to integrate technology. Technology use should be a central element in preservice teacher instruction, as it shapes teachers' pedagogical approaches to instruction (Cheon, Coward, Song, & Lim, 2012). In-service teachers, however, must often rely on professional development and self-exploration to enhance their technological skills (Barron, 2009).

Technology adoption in K-12 schools is defined by Hew and Brush (2007) as the use of desktop computers, laptops, handheld computers, software, smartphones, tablets, or the Internet for instructional or assessment purposes. While some factors influencing technology adoption within a school come from administrative- or district-level initiatives, it is ultimately up to an individual whether a technology-based tool will be used in the classroom (Straub, 2009). A plethora of studies has sought to measure factors affecting technology adoption for teachers, identifying a multitude of contributions influencing this process (Inan & Lowther, 2011). Ultimately, factors originate from both the individual teacher and school, including teachers'

beliefs and attitudes, teachers' demographic characteristics, availability and access to computers and resources, and school support structure (Inan & Lowther, 2011).

Teacher Beliefs and Attitude

Individual teachers' beliefs and attitudes both hinder and encourage the active use of a technology-based tool within teaching practice (Hew & Brush, 2007; Inan & Lowther, 2011). Inan and Lowther (2011) define teacher beliefs as a teacher's perception of technology's ability to influence student learning and achievement. More specifically, Hew and Brush (2007) state that teacher beliefs about the influence of technology on teaching and learning are directly linked to pedagogical beliefs and can influence one's overall attitude towards technology in the classroom. As such, a teacher's attitude toward technology in the classroom is guided by his or her personal perception of their capabilities and the skills required to operate and integrate technology into teaching practices (Inan & Lowther, 2011).

In one 2011 study, 1,382 K-12 teachers in Tennessee were surveyed about what they perceived as barriers to technology integration (Inan & Lowther, 2011). Teacher beliefs and attitudes represented the fourth and first (respectively) most influential factors when integrating technology in the classroom. Together, these factors mitigated the influence of indirect, or external, factors, including school structure and resource availability (Inan & Lowther, 2011). Paradoxically, Hew and Brush (2007) credited school structure and resource availability and access with positively affecting a teacher's attitudes or beliefs concerning technology. Internal and external factors can encourage technology adoption, both in isolation and through interaction. For example, if an individual has a high level of self-efficacy and a personal interest in a technology platform, technology adoption is not contingent on the presence of external encouragement or support. Conversely, when an individual receives meaningful and effective

training on a technology-based program, they may be able to adopt the platform regardless of personal beliefs and attitudes. Ultimately, external factors can shift internal barriers, while internal factors have the ability to outweigh external factors (Hew & Brush, 2007; Inan & Lowther, 2011).

Furthermore, teacher beliefs and attitudes about a particular tool or technology-based approach can have a dominant effect on its integration (Teo, 2012). As a result, it is important to assess teachers' expectations in order to determine their intent to integrate technology. The Technology Acceptance Model (TAM) developed by Davis, Bagozzi, and Warshaw (1998) is used to explain technology users' behaviors across various technologies. This model has been implemented in various fields like business, medicine, and education (Teo, 2012). TAM reviews the causal relation between a tool's perceived usefulness (PU) and its perceived ease of use (PEU) (Teo, 2012). Inan and Lowther (2011) define TAM as "a widely accepted conceptual framework that explains how users perceive and use a new technology" (p. 140). Consequently, a multitude of studies within the field of K-12 education have implemented this measure to assess the acceptance of a particular technology (Inan & Lowther, 2011; Robinson, 2003; Teo, 2012). While TAM has received accolades as a predictor of technology use and integration, it is not without its critics. Legris, Ingham, and Collerette (2003) identify one shortcoming of TAM to be its inability to influence external variables. As such, further research is recommended on how to use TAM concentrating on factors outside of the internal perceptions that drive technology integration (Legris et al., 2003; Straub, 2009; Teo, 2012).

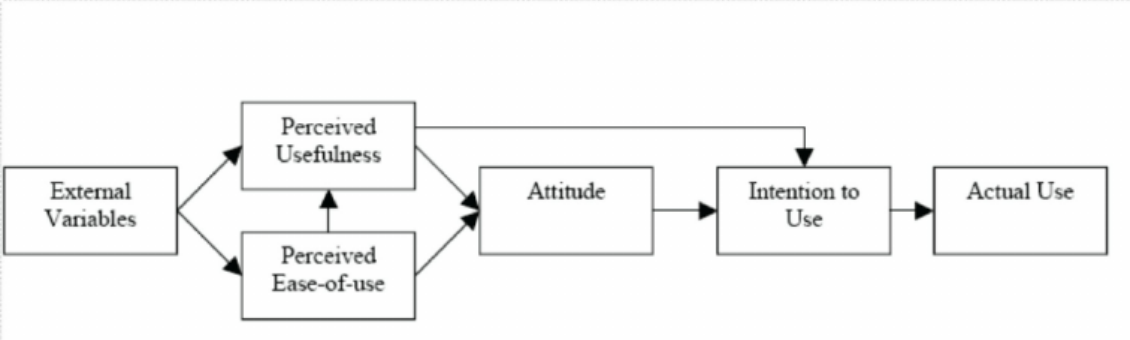

Figure 2.2. Davis et al.'s (1989) Technology Acceptance Model (p. 984).

Demographic Characteristics of Teachers

Researchers have identified various demographic components as potential factors that influence the adoption of technology. While many previous studies have focused on the overall teacher population, minimal research has been conducted solely on special education teachers. The subsequent sections summarize the results of previous research targeting demographic characteristics that affect technology adoption.

Age. Prensky (2001) identifies those born into the technology age as *digital natives*. People born prior to this period and did not experience technology during their childhood are referred to as *digital immigrants*. As these labels suggest, a technology user's age can reflect his or her comfort level and overall ability to adopt and adapt to new technology tools (Prensky, 2001). Demonstrating this concept, Robinson (2003) conducted a survey of 116 teachers measuring internal and external factors affecting their technology adoption. Overall, self-reported age was determined to negatively affect technology adoption. These results were corroborated by Inan and Lowther (2011)'s larger-scale study consisting of 1,382 teachers, which produced similar findings. In all, these results confirm that age is a factor in technology adoption for all teachers; however, results are not specific to special education teachers.

Teaching experience. Teaching experience is often a factor that aligns with participant age. As a result, many findings in this demographic category mirror that of the aforementioned variable of age. Both Robinson (2003) and Inan and Lowther (2011) found similar results about the effects of age and teaching experience on technology adoption.

Sugar, Crawley, and Fine (2004) found more specific results related to teacher experience and technology adoption, demonstrating that teaching experience, specifically for teachers with over 20 years of experience, affected technology adoption. However, for teachers with one to five years of teaching experience, this factor was not an accurate predictor of technology use in the classroom. Russell, O'Dwyer, Bebell, and Tao (2007) conducted a more explicit study examining teacher tenure and technology adoption. Results showed that educators who had been teaching for longer periods of time used technology less frequently than their colleagues with shorter tenures. Furthermore, Russell et al. (2007) measured teacher tenure within a specific position as related to technology use. These results showed that as teachers moved to various positions, they were less likely to implement technology in the classroom. Participants reported that this reluctance was a result of being unfamiliar with new curricula and content areas (Russell et al., 2007).

Education level. Sugar et al. (2004) attempted to measure the effects of teachers' education levels on technology adoption; however, 89.3% percent of the participants reported obtaining a master's degree. Thus, this study was not a valid means of assessing technology adoption because of the lack of diverse participant education levels. As this study focused on secondary education participants in Minnesota, it is unclear if these results will be replicated. However, since many states now require teachers to earn master's degrees to obtain tenure or advanced teaching certification, these results may be difficult to assess.

Gender. Venkatesh, Morris, and Ackerman (2000) conducted a longitudinal field study involving 420 individuals across four different professional organizations to determine if gender was a factor impacting long-term adoption of new software. Findings showed that gender did play a role in predicting long-term adoption as men were more likely to adopt technology long-term.

Other studies focusing specifically on education have contradicted Venkatesh et al. (2000), though. Both Sugar et al. (2004) and Waugh (2004) found that gender was not a statistically significant factor in measuring technology adoption among educators. Carlson, Brauen, Klein, Schroll, and Willig (2002) report that 85% of all special education teachers within the U.S. are female. Despite this disproportionate representation, it is unclear if gender plays a role in technology adoption for special education teachers.

Teaching concentration. Research has also been conducted pertaining to technology adoption and subject area (Robinson, 2003; Sugar et al., 2004). Business and science teachers have demonstrated a high level of technology adoption, with mathematics teachers reporting lower usage (Sugar et al., 2004). Within the special education field, Nam, Bahn, and Lee (2013) employed TAM to assess special educators' adoption of assistive technologies. However, the results focused on special education teachers as a whole, not on the population they served–for example, children with autism, mild disabilities, multiple disabilities, behavioral disorders, or other health impairments. While technology acceptance among subject-area teachers and special education teachers in general has been examined, teachers who work with specific populations within special education have not been thoroughly examined. The present study targets this data point as a measure that potentially impacts technology adoption.

Grade span. Ehrlich, Sporte, and Sebring (2013) summarized findings concerning teacher, student, and administrator technology use in the Chicago School District. Survey data was collected in 2011 from 11,806 teachers at various levels, including elementary and high schools. Ehrlich et al. (2013) concluded that there were "no appreciable differences between elementary school and high school teachers" in terms of how they used technology (p. 13). While in general teacher usage rates were similar across the elementary and high school levels, some teachers from special-admissions schools, known as magnet schools, reported an increased use (Ehrlich et al., 2013).

Collectively, teacher demographic information has been used to predict and measure technology adoption (Inan & Lowther, 2011; Robinson, 2003; Russell et al., 2007; Sugar et al., 2004). This data, along with criteria specific to special education teachers, was used to measure the use and adoption of technology-based progress-monitoring protocols for non-academic IEP goals. Currently, though, a research gap exists because the demographic factors affecting technology adoption among special education teachers have yet to be clearly identified. These internal factors, along with external measures such as availability and access to resources, was used to determine teachers' overall use of technology protocols.

Availability and Access to Computers and Resources

Availability and access to computers and other technology resources is perhaps the most prevalent barrier to technology integration in K-12 schools. According to Hew and Brush (2007), "The lack of resources may include one or more of the following: (a) technology, (b) access to available technology, (c) time, and (d) technical support" (p. 226). Reflectively, resources represent a portion of external factors that can either limit or encourage the use of a technology-

based tool. In K-12 schools, various levels of technology resources are present, as state and local funding for these tools is not consistently allocated (Inan & Lowther, 2010).

Lack of time is a familiar barrier within special education. Regarding technology, teachers need adequate time to preview technology tools in order to understand their benefits and determine how to effectively implement the tools into their practice (Hew & Brush, 2007). This time constraint is added to other factors specific to special education teachers' responsibilities. When asked how time consuming it was to produce teacher-made materials, participants reported that creating new materials can take up to an hour (Lunker & Bowen, 2010). In Vannest and Hagan-Burke's (2010) study on teacher time-use in special education, self-contained classroom teachers engaged in instructional support 16.5% of the day, with academic instruction making up 12.5% and discipline making up 11.8%. Paperwork accounts for 9.6% and assessment only 3.3% of the day. Time spent on paperwork and assessments are lower for self-contained teachers as compared to the statistical average generated in this study: 12.1% on paperwork and 4.4% on assessment for special education teachers in full-time inclusive settings (Vannest & Hagan-Burke, 2010). Ultimately, with these responsibilities, it is difficult for special education teachers to dedicate time to learning a technology tool.

The final resource-based barriers Hew and Brush (2007) identify pertain to a lack of technology-based support. Inan and Lowther (2010) claim this lack of support is the second highest factor influencing technology adoption, after the presence of technology equipment. As previous studies have made evident, "teachers usually need assistance while integrating technology, should problems arise when installing and using software or handling technical issues. With sufficient technical support, teachers feel more competent and ready to integrate technology" (Inan & Lowther, 2010, p. 147-48). While formalized and specially trained

technology support personnel are recommended by Hew and Brush (2007), Inan and Lowther (2010) also encourage the use of peer, administrative, and community support in technology integration.

School Support Structure

Responsibility for developing technology skills falls within the job parameters of both teachers and school-based administrators (Barron, 2009). While professional development is necessary for technology integration, it is not a sole predictor of successful implementation of a technology tool. According to Inan and Lowther (2011), a widening gap between early technology adopters and less technology-inclined staff members makes professional development difficult, as individuals need various levels of support to encourage learning and promote technology.

Additionally, professional development and personal reflections are needed to effectively integrate technology into pedagogy (Hixon & Buckenmeyer, 2009). Often, trainings are focused on the implementation of an individual technology tool or concept, and teachers must generalize these skills to their particular disciplines (Hixon & Buckenmeyer, 2009). As Hughes (2005) notes, technology integration can function on three levels: replacement, amplification, or transformation. Hews and Brush (2007) contest that teachers who are largely unexposed to transformative technology support pedagogy resulting in a hyper-focus on how to operate the technology instead of how to effectively utilize it in their teaching practices.

Knowledge- and skill-based barriers represent both internal and external factors affecting technology implementation. Individualized efforts are required to master technology-based trainings. Additionally, many technology-based trainings are self-elected (Hixon & Buckenmeyer, 2009). Nonetheless, it is primarily an administrator's obligation to plan, develop,

and implement professional development for teachers (Durtschi, 2005). While seeking individualized training and personal mastery represent internal factors, school- or district-wide trainings reflect external factors affecting technology adoption.

In additional to providing training and support, time and attention are factors that can be controlled by school-based administrators (Brush & Hew, 2007). For example, inflexible schedules that do not allow for exploration of new technology can hinder integration (Brush & Hew, 2007). Without ample time to become comfortable with new technologies, teachers often abandon a tool out of frustration (Straub, 2009). In addition to time dedicated to technology integration, leadership focus can influence the application of a tool (Hew & Brush, 2007), as demonstrated in Fox and Henri's (2005) study, in which teachers who were surveyed reported a principal's lack of understanding and engagement with technology as negatively affecting their overall implementation of technology-based requirements. Furthermore, Lawson and Comber (1999) highlight the importance of school-based administrators following up with technology-based initiatives. Without long-term planning and monitoring of outlined goals, technology integration has been shown to fail (Lawson & Comber, 1999).

As mentioned when reviewing teacher beliefs and attitudes, school-based factors can influence teachers' perceptions of their overall ability to infuse technology into the classroom (Legris et al., 2003). Furthermore, resources and demographic information have been shown to be predictors in classroom-based technology adoption. As such, Legris et al. (2003) believe it is critical to take these factors into consideration when measuring teacher adoption of a new technology-based tool. These external factors have been demonstrated to help elaborate upon data that can be collected through TAM (Legris et al., 2003).

Summary

Progress monitoring, a federally mandated element within each child's IEP, is recognized as the IEP component with the lowest compliance level. While standardized methods for monitoring student growth in academic areas is widely used, it is unknown how this practice is implemented for functional IEP goals, as teachers are tasked with developing their own monitoring tools and plans. Evidence-based practices and technology-enhanced progress-monitoring plans have been established, yet there is a perceived gap between research and practice. Various barriers to technology integration can be identified within school settings; however, these studies do not take into account the unique task of a special education teacher focused on measuring progress in non-academic areas. This research aims to uncover current practices within the classroom concerning progress monitoring on functional goals and to identify specific factors to increase or decrease the use of technology-based protocol in assessing student growth, thereby producing more meaningful data that is legally defensible.

Chapter Three: Research Methodology

Introduction

This research was conducted to gain a more in-depth understanding of practices used to monitor the progress of learning in non-academic areas for students with disabilities. As the increased use of technology continues to influence teaching practices, it is unknown how technology has been applied to improve data-collection practices considering specific and individualized student goals within non-academic domains. A concurrent nested, mixed-methods study was conducted to determine which tools are currently used by teachers to monitor student learning, what factors hinder or support their use, how such tools are used, and why teachers elect to use them.

Purpose and Research Questions

The purpose of this mixed-methods study is to determine the current practices and influential factors in implementing a technology-based progress-monitoring plan focused on non-academic IEP goals. Specific research questions are as follows:

1. What are the characteristics of special education teachers who are using or have used technology-enhanced progress-monitoring protocol plans?
    a. Do internal factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
    b. Do external factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
2. What tools are teachers using to implement technology-based progress-monitoring protocols for non-academic IEP goals?

3. Among teachers who report having used technology-enhanced progress-monitoring protocols, what are their perceptions about the usefulness and ease of using technology-based tools?
4. How do teachers perceive barriers and benefits to using technology for progress monitoring for non-academic IEP goals?

Research Design and Rationale

A mixed-methods approach was implemented to address the questions posed in this research study. More specifically, data was collected in a concurrent, simultaneous manner to produce a more comprehensive picture of technology-driven progress monitoring of non-academic goals among special education teachers. According to Hanson, Creswell, Clark, Petska, & Creswell (2005), a concurrent nested design is employed when quantitative and qualitative data are collected and analyzed at the same time, and priority is given to one form of data. In this study, priority is given to quantitative data, as it is used to describe the characteristics of the sample under study. Additionally, quantitative measures helped determine the significance of both internal and external factors affecting technology adoption. Quantitative data also provided a general understanding of the research problem, while qualitative data refined and explained these results through an in-depth exploration of the sample's views (Creswell, 2014). Collectively, the data and its analysis provide a thorough exploration into teacher practices, systematic structures influencing these practices, and teacher mental models. Hanson et al. (2005) further highlight this design as “useful for gaining a broader perspective on the topic at hand” (p. 229).

Methodology

Stages of Data Collection

Data collection began after Drexel's Institutional Review Board (IRB) granted approval. By incorporating a concurrent nested design, quantitative and qualitative data was collected in one thorough stage consisting of an electronic survey. Potential participants were solicited via email. The online survey collected responses during a three-week window. Participants who were directly solicited received reminder emails at the beginning of Weeks two and three of the data-collection window. Since a snowball sampling method was employed, participants were asked to recruit other potential participants by forwarding the information to other special education teachers.

Within the survey, participants identified their implementation practices for technology-based progress-monitoring protocols for non-academic IEP goals. Progression of the survey was customized based on teachers' use of technology in this area, helping ensure that data pertaining to perceptions of usefulness and ease of use were collected only from participants who had experienced technology-based progress-monitoring protocols for non-academic IEP goals.

Table 3.1

Research Timeline

Activity	**Date**
Proposal Defense	Fall 2016
Drexel IRB Certification	Fall 2016
Surveys distributed to participants (Survey was active for three weeks. Participants received initial contact (Week 1) and two reminder emails (Weeks 2 and 3).	Winter 2017
Data Merged	Winter 2017
Data Interpreted	Winter/Spring 2017
Report Findings	Spring 2017

Instrumentation

Instrument description. A web-based survey was constructed using Qualtrics, an online data-collection platform. This tool was used to determine how participants were implementing technology to enhance progress monitoring. Participants were asked both school-based and personal demographic questions related to school type; school population and teacher gender, age, teaching experience, and education level (seven closed questions). Participants were also asked about types of technology-based resources and school supports within their district or organization (nine Likert-scale questions). Knowledge-based questions concerning teacher practices on data collection were also included (eight Likert-scale questions). Additionally, teachers were asked to identify specific traditional and technology-based tools implemented in

progress monitoring non-academic goals (two checklist-based questions with *other* option.) Perceived usefulness and overall ease of use were determined through questions adapted from the Technology Adoption Model protocol (Davis, 1989) (20 Likert-scale questions). Finally, teachers were asked one of two open-ended questions identifying their rationale for implementing or not implementing technology-based protocols in their classrooms. The full survey protocol is located in Appendix A.

Identification and invitation. The web-based survey was sent out via email to special education teachers and administrators within various school districts based on availability or contact information. Contact information was accessed through school-district websites and through district personnel with whom the researcher has a collegial relationship. Additionally, of the researcher used social media, Twitter and Facebook, to target a select group of participants through specialized hashtags (#spedchat, #progressmonitoring, #spedresearch) and soliciting special education teacher groups, which resulted in increased exposure to potential participants. Furthermore, participants were asked to solicit others qualified to participate.

Piloting the initial instrument. In order to increase the survey results' validity, survey items were aligned with the research questions presented in this study (see Table 3.2). Furthermore, multiple SMEs in the areas of special education and technology and a survey design expert reviewed the survey. This expert review panel allowed for survey modifications to be made to increase study validity (Russ-Eft & Preskill, 2009).

Data collection. The purpose of this study required data to be collected from individual educators at various sites. The researcher determined that an online survey would provide access to an increased number of participants. As Russ-Eft and Preskill (2009) note, researchers are increasingly turning to email- and web-based surveys as they simplify distribution and data

collection. Also, online methods allow participants broader geographical reach for survey access. Furthermore, this means of data collection has been shown to yield similar results to paper-based and traditional surveys (Russ-Eft & Preskill, 2009).

In order to gain access to these participants, multiple methods were used. Participants were recruited through social media and email communications. Facebook and Twitter were used to target potential participants meeting the criteria for this research. By tagging specific special education users, using high-traffic hashtags and targeted retweets, eligible participants could access the survey. Additionally, email invitations were sent out to special education teachers at various organizations. A request was made for participants to share the information with other suitable colleagues, encouraging the growth of the sample population. Overall, the sampling methods combined purposeful targeted sampling and snowball sampling (Creswell, 2014).

Participants were able to access this study's survey on both computers and mobile devices. A three-week window was provided for participants to complete the survey (as previously discussed). An anonymous link was sent to participants through email and on social media. No personal information, such as name or email, was collected. The *Prevent Ballot Stuffing* setting was enabled in Qualtrics to prevent users from participating more than once. While this method is not foolproof, it provided an added measure of security by only allowing one response per IP address. Anonymous participant responses were automatically collected and stored in Qualtrics, which stores encrypted data, ensuring participant confidentiality.

Concurrently, reliability was addressed in two ways to encourage consistency within the results. First, the purposeful targeted sampling was used to identify eligible participants. Additionally, participants were encouraged to share this survey with other qualified individuals.

This added phase of snowball sampling was used to produce an adequate sample population. To reduce situational factors such as participant fatigue, mood, or motivation, the survey was administered virtually and could be taken at a participant's leisure (Russ-Eft & Preskill, 2009). Furthermore, participants only answered perception-based questions on technology-enhanced protocols if they indicated they had used this practice. This step helped eliminate the collection of erroneous data from users who had not experienced technology-based progress-monitoring protocols for non-academic IEP goals.

After the data collection was completed, data was transferred from Qualtrics' secure servers to an external hard drive. All associated printed documents were stored in a locked file cabinet. After three years, the documents will be virtually destroyed or shredded.

Study Sample and Procedures

Population, Sample, and Sampling Methods

The target population for this study was special education teachers who serve students with non-academic IEP goals, including but not limited to life skills, behavior goals, executive functioning skills, vocational goals, and social skills. These participants are also responsible for data collection, analysis, and reporting progress on IEP goals. Additionally, the target population should be actively engaged in progress monitoring on individual student goals – a legally mandated special education practice (Etscheidt, 2007).

The originally intended target population for this study had the potential to yield a small sample size. Few teachers fit this role of serving a specific group of students with a particular set of needs, as special education teachers make up a fraction of teaching staff within school districts. As such, a non-site-specific approach was used to conduct this research. Through this

method, special education teachers representing various geographic locations across the United States, service roles, and cultural backgrounds were surveyed.

Due to the location and resources afforded by the researcher, the majority of participants resided in the tristate area (Pennsylvania, New Jersey, and Delaware). However, social media and word-of-mouth were also used to solicit participants and diversify the sample population geographically. The sample population represents districts from urban, rural, and suburban areas. With a diverse sample group, it is possible to identify more complex factors influencing the use of technology-driven progress-monitoring protocols. Furthermore, these selection criteria allowed the researcher to gain access to an appropriate sample that will address the gaps in field-based research. Cook (2014) implores researchers to enter this field, as evidence-based practices are desperately needed to close the research-to-practice gap for teachers of students with significant needs.

Using a concurrent mixed-methods research design, both qualitative and quantitative data were collected from the same sample through one survey. In total, this study received responses from 68 individuals who identified with the criteria outlined in the survey population description. In total, 53 responses were collected through email solicitation, while 15 responses were collected through social-media engagement. Of the 68 participants, 11 entries were eliminated, as participants did not complete more than 50% of the survey. In total, 57 completed surveys were analyzed and coded as a part of this study. The U.S. Department of Labor (2015) reports the total number of special education teachers within the U.S. to be around 450,700. With a sample size of 57 participants, the results of this study are within a 95% confidence level with a 13% margin of error.

Each of the participants included in the study completed the self-reported demographic section. These results yielded a sample population consisting of 88% females (50 females and 7 males). Participant ages ranged from 22 to 63, with an average age of 40. Self-reported race and ethnicity yielded a population of 98% White, with 1.8% identifying as African American. From an education standpoint, the majority of the sample population (52%), reported having a master's degree plus additional college credits, while 48% had earned a master's or bachelor's Degree. Teaching experience ranged from one year to 42 years, with an average of 13 years of service.

As previously stated, participants were recruited through online methods, including email and social media. Additionally, participants were asked to identify other potential participants and forward the active survey link within the data-collection window. Thus, the sampling method was both purposeful, targeting specific participants, and snowball, asking participants to identify others (Creswell, 2014).

Site Description and Site Access

Since this study is non-site-specific, there are no concerns surrounding site access. Individuals were solicited through email and/or social media. As a result, participants individually determined if participating in this study was appropriate, acceptable, and possible within the given time constraints. The rationale behind this non-site-specific study was to gather varied responses from participants across a larger geographical area, assessing the research problem across environments.

Data Analysis

Quantitative and qualitative data were collected together but analyzed separately. Likert-scale items, closed questions, and open-ended questions were analyzed using different appropriate methods to identify key factors that influenced the use of a technology-based

progress-monitoring protocol. SPSS was used for descriptive and inferential quantitative analysis, while traditional coding methods were implemented to find patterns and themes in qualitative data. After each type of data was analyzed, meta-inferences were drawn from a combination of quantitative and qualitative findings. See Table 3.2 for alignment between research questions, variables, survey items, and analysis.

Table 3.2

Research Questions, Variables, Survey Item(s), and Analysis Matrix

Research question	**Variables**	**Survey item(s)**	**Analysis**
RQ1.What are the characteristics of special education teachers who are or using technology-enhanced progress-monitoring protocol plans?			
RQ1a. Do internal factors significantly impact the use of technology-enhanced progress monitoring of non-academic goals?	IVs= Internal Factors: age, gender, teaching experience, education level, grade taught, population taught, ethnicity/race, teacher belief DV= use of technology to progress monitor non-academic IEP goals	Q49-Q54	Chi-square
RQ1b. Do external factors significantly impact the use of technology-enhanced progress monitoring of non-academic goals?	IVs: External Factors: school location, school type, school SES, availability of resources, support from administration, exposure to training, technology-based support DV= use of technology to progress monitor non-academic IEP goals	Q3-Q11 Q16-Q44	Chi-square
RQ2.What tools are teachers using to implement a technology-based progress-monitoring	Descriptive Variables: Progress-Monitoring Tools	Q18-Q19	Descriptive Analysis

protocols for non-academic IEP goals?			
RQ3. Among teachers who report having used technology-enhanced progress-monitoring protocols, what are their perceptions about the usefulness and ease of use of technology-based tools?	Descriptive Variables: usefulness and ease of use	Q22-Q42	Descriptive Analysis
RQ4. How do teachers perceive barriers and benefits to using technology for progress monitoring for non-academic IEP goals?	Qualitative Variables: Technology Barriers and Technology Benefits	Q43-44	Descriptive Coding and In vivo Coding

Note: IV= independent variable; DV= dependent variable.

Chi-square testing was implemented during analysis of research questions 1a and 1b, quantitative data related to internal and external variables affecting technology adoption for progress monitoring on non-academic IEP goals. Chi-square is a statistical test used to analyze the variation within an observed set of data as compared to the expected frequencies (Ravid, 2010). Ravid (2010) identifies three main assumptions concerning chi-square testing. First, observations are considered independent; as such, participant responses fall into only one category. Second, observations must be measured in frequencies; these observed frequencies are compared to the expected frequencies, resulting in measurable data denoting significance. Finally, categories used to organize observations, including interval, ordinal, or ratio, are constructed in a logical and thoughtful manner. For the purpose of this study, it is crucial to note that chi-square testing requires a minimum of five observations within a specific category (Ravid, 2010). If a particular category did not have a minimum frequency of five, this data was not analyzed. As a result, the impact of race and ethnicity was unable to be analyzed.

For Likert-scale survey items regarding factors affecting technology adoption of progress-monitoring protocols, results were collapsed from a four-scale response into

dichotomous groups (agreement or disagreement), then subsequently analyzed through a chi-square statistical test. This process allowed for the determination of significant relationships, notable beyond the expected frequency of a measure, between each independent variable and the use of technology-enhanced protocols for non-academic IEP goals. Closed demographics-based questions were also analyzed using a chi-square, as the responses were recorded on a nominal scale that generated independent groups (Ravid, 2010).

Descriptive statistics were used to analyze quantitative items related to the report tools used in the field (RQ2), and participant-reported perceived ease of use and overall usefulness of technology in progress monitoring non-academic IEP goals (RQ3). First, measures of central tendency, including mean, median, and mode, were reported to summarize and describe the data set. Furthermore, standard deviations were reported to describe the level of variance within the data set. Together, these measures provide a clear picture of an average response, as well as to what extent other participants vary from this statistical average (Ravid, 2010). Appropriate visuals are provided to graphically illustrate these data.

Qualitative items (RQ4), including open-ended responses, were coded in order to analyze data using both descriptive and in vivo coding. Descriptive coding, or "topical coding," is an effective method for analyzing most types of qualitative data, providing a tool to categorize, summarize, and index data contents (Saldaña, 2013). In vivo coding, also known as literal coding, helps identify patterns and define them within the participants' language (Saldaña, 2013). Employing these two methods, responses were reviewed twice in order to code the data and identify emerging themes. Conclusively, data was organized in order to determine who is implementing a technology-based progress-monitoring protocol, what tools are popular, and barriers and supports for using technology-enhanced practices.

Finally, a meta-analysis was conducted in order to assert inferences based on the integration of qualitative and quantitative results. Onwuegbuzie and Johnson (2006) outline the criteria for conducting a meta-analysis within a concurrent mixed-methods design:

> (a) both the quantitative and qualitative data are collected separately at approximately the same point in time, (b) neither the quantitative nor qualitative data analysis builds on the other during the data analysis stage, and (c) the results from each type of analysis are not consolidated at the data interpretation stage, until both sets of data have been collected and analyzed separately. (p. 53)

After data collection is completed and quantitative and qualitative data have been interpreted, meta-inferences can be made that incorporate findings from both interpretations. Teddlie and Tashakkori (2008) define inferences as a final outcome of a study that reflects a conclusion, new understanding of, or further explanation related to the phenomenon that was studied. As a result, these meta-inferences allow the researcher to make recommendations for action-based solutions to the research problem and suggestions for further research.

Ethical Considerations

Prior to beginning research, the Drexel IRB conducted a thorough review of the research methods and proposed procedures. The study qualified for exempt status, highlighted by regulation 45 CFR part 46, Subpart D, since research was conducted in an established educational setting and involved a common educational practice – progress monitoring. Additionally, the research is focused on educational assessments and did not directly involve students as subjects, thus eliminating potential risks to vulnerable populations.

In accordance with federal regulation 45 CFR 46 (Protection of Human Subjects 2009), subjects were informed about the study's purpose, expected duration, procedures, potential risks, and anticipated benefits prior to granting their consent to participate (see Appendix B). A survey was used to gather information in order to identify participants and understand general practices.

Data was encrypted and stored in Qualtrics' secure servers. Additionally, all collected data, both electronic and paper, will be destroyed three years after completion of the study.

Summary

Through a concurrent mixed-methods study, data was collected using an online survey. Participants were solicited via email and social media to encourage participation. Both qualitative and quantitative measures were included in this protocol. Subsequently, results were evaluated through data analysis software and qualitative coding methods. Throughout data collection, analyzing, and reporting, participant confidentiality was ensured with the support of encryption software. Overall, the data collected sought to identify the characteristics of special education teachers who chose to implement a technology-based progress-monitoring protocol for non-academic IEP goals, explore the extent to which teachers used technology to implement a progress-monitoring protocol for non-academic IEP goals, determine what tools were being utilized, and determine what internal and external factors impacted this implementation.

Chapter Four: Results and Interpretations

Introduction

This chapter summarizes the results collected through this mixed-methods study. The study's overall purpose was to determine the current practices and influential factors in implementing a technology-based progress-monitoring plan focused on non-academic IEP goals. As concerns over teacher accountability and student progress increase, technology-based progress monitoring on academic goals has become a common practice. Progress monitoring on functional IEP goals has gained increased attention from professionals in the special education field, as the implementation of this mandated practice often fails.

Through an online survey, 57 special education teachers shared their practices, perceptions, and implementation plans for technology-based progress monitoring to answer the following research questions:

1. What are the characteristics of special education teachers who are using or have used technology-enhanced progress-monitoring protocol plans?
    a. Do internal factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
    b. Do external factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
2. What tools are teachers using to implement technology-based progress-monitoring protocols for non-academic IEP goals?
3. Among teachers who report having used technology-enhanced progress-monitoring protocols, what are their perceptions about the usefulness and ease of use of technology-based tools?

4. How do teachers perceive barriers and benefits to using technology for progress monitoring for non-academic IEP goals?

Quantitative Results

Characteristics of Special-Education Teachers Who Use Technology-Enhanced Progress-Monitoring Protocol Plans

In order to determine which internal and external factors impact the use of technology for progress monitoring of non-academic IEP goals, special education teachers were surveyed using Likert-scale and multiple-choice items. All internal and external factors were analyzed using Pearson's chi-square test of independence in order to determine what, if any, factors contributed to participants' use of technology for progress monitoring. The following subsections summarize the results of this analysis.

Internal factors' impact on teachers' use of technology-enhanced progress monitoring on non-academic goals. Internal factors are defined as factors relating to a participant's individual status and personal beliefs. The factors measured in this study include age, gender, experience level, highest level of education, grade level taught, and population taught. Additionally, teacher beliefs on the effectiveness of progress-monitoring tools were assessed. The following table summarizes the impact of internal demographic factors (Table 4.1) and teacher beliefs (Table 4.2) on the use of technology for progress monitoring non-academic IEP goals.

Table 4.1

Frequency and Percentage of Internal Factors (Demographics) by Teachers Who Use Technology for Progress Monitoring Non-Academic IEP Goals (n=39) or Teachers Who Do Not Use Technology (n=18).

Internal Factors (Demographic)	**Technology for Progress Monitoring Non-Academic IEP Goals**		χ^2
	No Use	Use	
Age[a]			.236
Below Average	27.7% (9)	72.7% (24)	
Average/Above Average	42.9% (9)	57.1% (12)	
Gender			.293
Female	34.0% (17)	66.0% (33)	
Male	14.3% (1)	85.7% (6)	
Experience[b]			.850
Below Average	32.4% (12)	67.6% (25)	
Average/Above Average	30.0% (6)	70.0% (14)	
Highest Level of Education[c]			.384
BA + MA	25.9% (7)	74.1% (20)	
Above MA	36.7% (11)	63.3% (19)	
Grade Level Taught[d]			.178
Elementary	25.9% (7)	74.1% (20)	
Middle	26.7% (4)	73.3% (11)	
High School	53.8%(7)	46.2% (6)	
Population Taught[e]			.592
Low Incidence	38.5% (10)	61.5% (16)	
High Incidence	25.9% (7)	74.1% (20)	

Note: Proportions within internal factors:

a. Age proportions are based on national averages of teacher ages in public schools. The average age of U.S. teachers is approximately 40 years old (NCES, 2016).
b. Experience proportions are based on national averages; the average years of experience among U.S. teachers is 14 years (NCES, 2016).
c. Highest Level of Education proportions are based in the completion of a bachelor's or master's degree program and the completion of a master's degree with additional college credits or the completion of a terminal degree.

d. Grade Level Taught proportions are based on traditional school subsets, including elementary (below grade 6), middle (grades 6-8) and high school (grades 9-12 and students ages 18-21).
e. Population Taught proportions are based on IDEA (2010) disability categories, including high-incidence disabilities such as learning disability or mild intellectual disability, and low disabilities, including autism, intellectual disabilities, and multiple disabilities.
*p<.05 **p<.01 ***p<.001

The results of chi-square testing on internal demographic factors as related to the use of technology for progress monitoring non-academic IEP goals determined that no internal factor significantly impacted a teacher's decision to implement a technology-based protocol. Age, as determined by classifying participants in groups below and above the national average age of 40 years (NCES, 2016), did not significantly impact technology use (X^2=.236; p>.05). Furthermore, the participants' genders did not influence technology use (X^2=.293; p>.05). No significant relationship was found between experience, education level, and technology use (X^2=.384; p>.05 and X^2=.178; p>.05, respectively).

Chi-square testing was also used to measure the impact of internal factors relating to teacher placement. As a result, it was determined that the grade-level span to which a teacher was assigned, including elementary, middle, and high school, did not influence technology use of progress monitoring non-academic IEP goals. (X^2=.178; p>.05). Finally, for internal demographic factors, participant technology use was assessed according to the population taught. The low-incidence population was comprised of teachers who instructed students in the following settings: life skills, multiple disabilities, emotional support, and autistic support. Conversely, the high-incidence population was representative of teachers instructing students in learning-support or co-teaching settings. Nonetheless, this factor also proved to be non-significant in impacting technology use (X^2=.592; p>.05). Collectively, no internal demographic-

based factor influenced a teacher's use of technology-based progress monitoring non-academic IEP goals

Beliefs. The following subsection summarizes the results of data analysis on teacher beliefs concerning the use of traditional, paper-based progress monitoring, technology-based progress monitoring, and the combined use of these methods.

Table 4.2

Frequency and Percentage of Internal Factors (Beliefs) by Teachers Who Use Technology for Progress Monitoring Non-Academic IEP Goals (n=39) or Teachers Who Do Not Use Technology (n=18).

Internal Factors (Beliefs)	**Technology for Progress Monitoring of Non-Academic IEP Goal**		
	No Use	**Use**	
Believe paper-based progress monitoring best meets needs of students			.259
Disagree	27.3% (9)	72.7% (24)	
Agree	39.1% (9)	60.9% (14)	
Believe paper-based progress monitoring best meets needs of teacher			.097
Disagree	23.5% (8)	76.5% (26)	
Agree	43.5% (10)	56.5% (13)	
Believe technology-based progress monitoring best meets needs of students			.027 *
Disagree	52.9% (9)	47.1% (8)	
Agree	15.8% (9)	77.5% (31)	
Believe technology-based progress monitoring best meets needs of teachers			.006 **
Disagree	58.8% (10)	41.2% (7)	
Agree	20.0% (8)	80.0% (32)	
Believe both paper and technology-based progress monitoring best meets needs of students			.493
Disagree	37.5% (3)	62.5% (5)	
Agree	30.6% (15)	69.4% (34)	
Believe both paper and technology-based			.624

progress monitoring best meets needs of teachers		
Disagree	33.3% (2)	66.7% (4)
Agree	31.4% (16)	68.6% (35)

Note: *$p<.05$.**$p<.01$. ***$p<.001$.

Chi-square testing was used to analyze the impact of teacher beliefs on the use of technology for progress monitoring non-academic IEP goals. Subsequently, a teacher's belief that paper-based progress monitoring best meets students' needs was found not to play a significant factor in the use of technology-based progress monitoring (X^2= .259; p> .05). With regard to the belief that paper-based tools best meet teachers' needs, this belief did not influence the likelihood of technology adoption (X^2= .259; p> .05).

Chi-square analysis was further applied to the beliefs concerning the use of technology-based progress monitoring. The results demonstrate that if a teacher believes technology-based progress monitoring non-academic goals best meets students' needs, they are significantly more likely to use technology to measure student growth (X^2=.027, p<.05). Moreover, teachers who believe technology best meets their own needs were highly likely to use technology-based progress monitoring (X^2= .006; p<.01).

Additional chi-square testing was conducted on the measure of beliefs reflecting the use of both paper-based and technology-based tools for progress monitoring non-academic goals. A teacher's belief that the combination of these tools best meets students' needs did not influence technology use (X^2=.493; p>.05). Additionally, it was determined that the belief that both tools best meet teachers' needs did not play a significant role in impacting technology use.

While demographic factors appeared to play no significant role in technology adoption for progress monitoring of non-academic IEP goals, some teacher beliefs influenced use.

Specifically, if a teacher believed technology-based progress monitoring best met their students' needs, they were likely to use technology for this purpose. Furthermore, if a teacher believed technology-based progress monitoring best met their own needs, they were highly likely to use technology. Other beliefs associated with traditional forms of progress monitoring or a combination of technology and traditional methods were determined not to play a role in technology adoption.

External factors' impact on teachers' use of technology-enhanced progress monitoring non-academic goals. The following section summarizes the results of data analysis relating to external factors and the likelihood of technology use for progress monitoring. External factors assessed in this study include school location, school type, socioeconomic status (SES) level, administrative support, availability of technology, and technology support. These results are summarized in the table below (Table 4.3) and interpreted in the following subsections.

Table 4.3

Frequency and Percentage of External Factors by Teachers Who Use Technology for Progress Monitoring Non-Academic IEP Goals (n=39) or Teachers Who Do Not Use Technology (n=18)

External Factors	No Tech Use for Progress Monitoring	Use of Tech for Progress Monitoring	$\chi 2$
School Location			.331
Urban	31.0% (9)	69.0% (20)	
Rural	46.2% (6)	53.8% (7)	
Suburban	20% (3)	80.0% (12)	
School Type			.560
Public	32.7% (17)	67.3% (35)	
Charter	20.0% (1)	80.0% (4)	
SES (Eligible for Title I Funding)[a]			.420
Low-Income	28.2% (11)	71.8% (28)	
High-Income	38.9% (7)	61.1% (11)	
Received Training in Progress Monitoring Non-Academic IEP Goals			.047*
Disagree	47.6% (10)	52.4% (11)	
Agree	22.2% (8)	77.8% (28)	
Received Training in Technology Tools for Progress Monitoring Non-Academic IEP Goals			.001**
Disagree	47.2% (17)	52.8% (19)	
Agree	4.8% (1)	95.2% (20)	
Encouragement from School-Based Administration			.002**
Disagree	54.2% (13)	45.8% (11)	
Agree	15.2% (5)	84.8% (28)	
Encouragement from District Administration			.006**
Disagree	52.2% (12)	47.8% (11)	
Agree	17.6% (6)	83.4% (28)	
Provided with Paper-Based Tools			.603

Disagree	26.9% (7)	73.1% (19)	
Agree	33.3% (10)	66.7% (20)	
Provided with Technology-Based Tools for Progress Monitoring			.538
Disagree	36.4% (8)	63.6% (14)	
Agree	28.6% (10)	71.4% (25)	
Provided with Technology			.666
Disagree	25.0% (2)	75% (6)	
Agree	32.7% (16)	67.3% (33)	
Provided with Technical Technology Support			.847
Disagree	33.3% (6)	66.7% (12)	
Agree	30.8% (12)	69.2% (27)	
Provided with Program-Specific Technology Support			.412
Disagree	37.5% (9)	62.5% (15)	
Agree	27.3% (9)	72.7% (24)	

Note: Proportions within external factors:

a. SES level was determined based on a school's eligibility for Title I funding reflected by teacher-reported percentage of students participating in free lunch program.

*p<.05 **p<.01***p<.001

Chi-square testing was used to assess the impact of external factors on the use of technology for progress monitoring non-academic IEP goals. The first set of factors concern the demographics of schools that employ survey participants. First, school location, as determined by participant self-report of an urban, rural, or suburban location, was found to have no impact on technology use (X^2= .331; p>.05). School type, whether public or charter, was also not a factor influencing technology use (X^2=.560; p>.05). Finally, SES level, as measured by a district's qualification for Title I funds, was not a significant factor impacting technology use for progress monitoring (X^2=.420; p>.05).

The next set of factors concerning training was analyzed through chi-square tests. The results showed that if a participant received training in progress monitoring for non-academic IEP goals, they were likely to use technology to measure student growth (X^2=.047; p<.05). Furthermore, if a participant received training in progress monitoring non-academic IEP goals specifically relating to the use of technology-based tools, they were extremely likely to use technology in this manner (X^2=.001; p<.001).

Chi-square tests measured the impact of administrative encouragement on technology use for progress monitoring. First, encouragement from school-based administration was found to play a highly significant role in impacting the use of technology for progress monitoring non-academic IEP goals (X^2=.002; p<.01). Additionally, encouragement from district-based administrators also highly impacted the use of technology for progress monitoring (X^2=.006; p<.01).

Finally, among external factors, chi-square testing was used to analyze resources related to progress monitoring and technology. It was determined that providing participants with paper-based progress monitoring did not impact technology use (X^2=.603; p>.05), nor did being provided with technology-based tools (X^2= .538; p>.05). The availability of technology, including laptops, desktops, and tablets, did not impact the use of technology-based progress monitoring (X^2=.666; p>.05). Technology support also did not impact the use technology for progress monitoring (X^2=.847; p>.05). Furthermore, program-specific technology support did not influence technology use in this area (X^2=.412; p>.05).

As displayed in Table 4.3, external factors were assessed to determine what, if any, relationship existed between school location, school type, SES level, administrative support, availability of technology, and technology support and the likelihood of technology adoption for

progress monitoring non-academic IEP goals. The results showed that factors related to training and administrative encouragement were significantly associated with the use of technology for progress monitoring. In contrast, factors relating to progress-monitoring tools provided by school districts, access to technology, and technology support were not significant factors related to the likelihood of technology use.

Traditional and Technology-Based Tools Being Implemented for Progress Monitoring Non-Academic IEP Goals

Two closed multiple-choice questions were used to determine the tools special educators use for both traditional paper-based progress monitoring and technology-enhanced progress monitoring. Participants used checkboxes to identify multiple tools used for progress monitoring non-academic IEP goals. An option for "other" was provided, along with a prompt to list the specific tool. Frequency measures were used to determine the number of participants who used each progress monitoring tool.

The results for survey Q18, *What traditional tools do you use to assess student progress non-academic, functional goals? (check all that apply),* were analyzed using descriptive statistics. Participants reported paper-based checklists and anecdotal notes as the most common traditional tools to collect data. Paper-based rubrics and task analysis sheets were also reported by about half of the population. Of the 57 participants, only 26% (n=15) reported using district-provided paper-based progress-monitoring sheets. Three participants selected the *other* option and listed behavior-tracking sheets, the T.A.L.I.D (Task, Area, Language, Interaction, Direction) System, and teacher feedback.

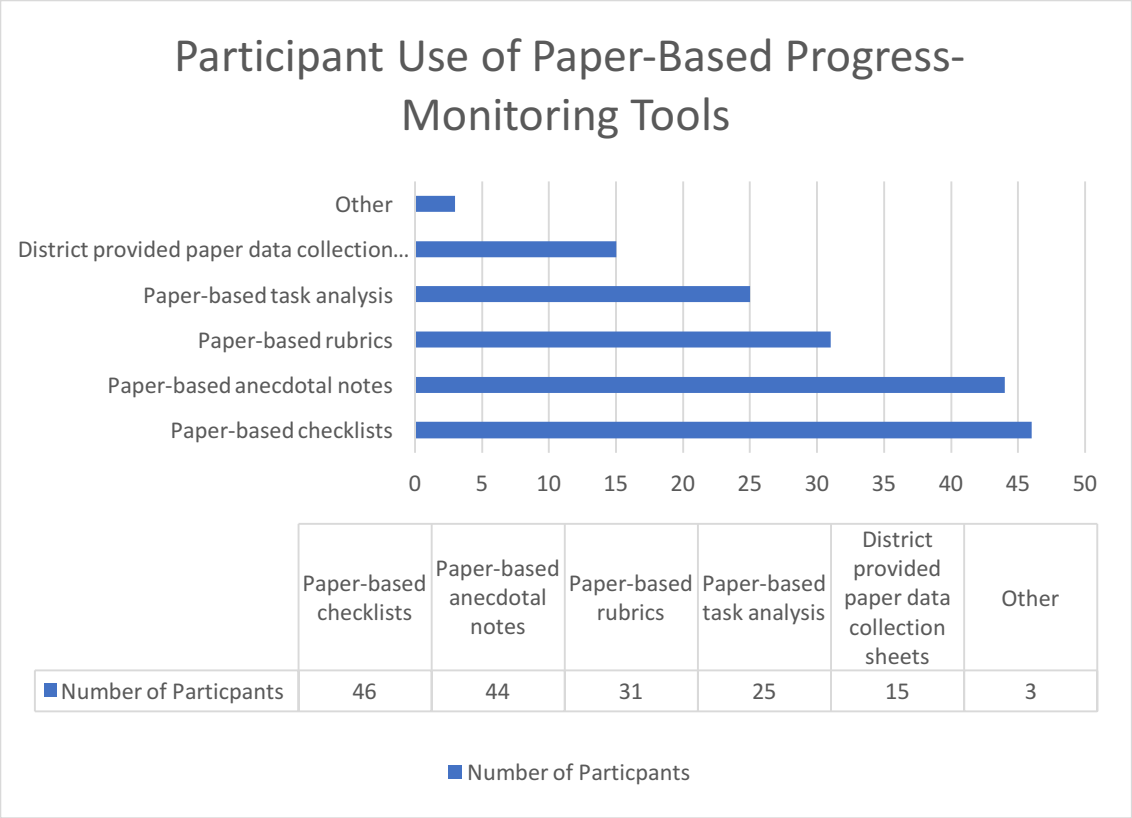

Figure 4.1. A graph of participant responses indicating use of traditional, paper-based progress-monitoring tools for non-academic IEP goals. (Note: Percentages do not equal 100%, as participants could choose multiple options).

The results for survey Q19, *What technology-based tools do you use to assess student progress non-academic, functional goals? (check all that apply),* were analyzed using descriptive statistics.

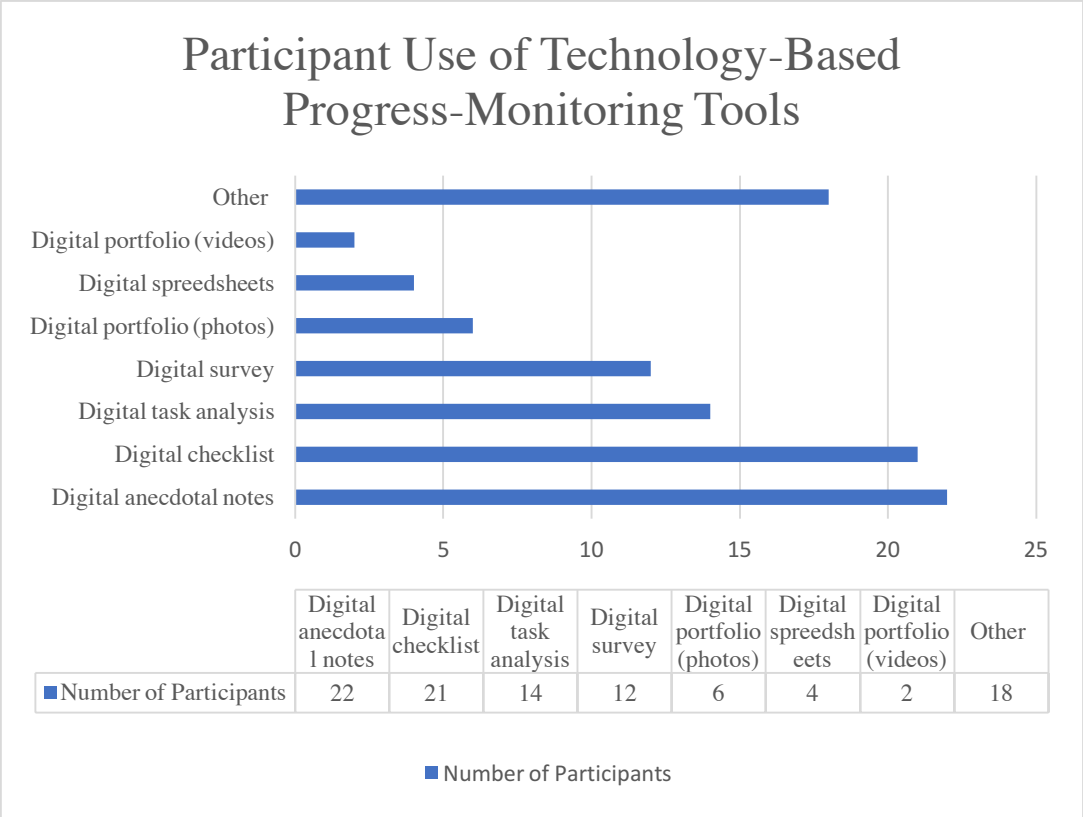

Figure 4.2. A graph of participant responses indicating use of technology-based progress monitoring tools for non-academic IEP goals. (Note: Percentages do not equal 100% as participants could choose multiple options).

The mostly widely used technology tools for progress monitoring were digital anecdotal notes and checklists. Digital task-analysis reports and digital surveys were also popular among about a quarter of the participants.

When given define "other" technology tools used for progress monitoring, five participants listed specific programs. Four participants highlighted special education case

management software, including EASY IEP, IEP Plus, and REALTIME. Further, four participants reported the use of comprehensive progress-monitoring programs, including AIMsWeb, Catalyst, and Review 360. Four participants highlighted the use of Google applications, including Google Drive, Google Forms, and Google Sheets. Two participants reported using Microsoft Excel to monitor student growth. Three participants reported using the application Class Dojo, while one participate each indicated Boardmaker Online, Behavior Tracker, and ReThink;.

Perceptions of Usefulness and Ease of Use of Technology-Based Tools for Non-Academic IEP Goals

Using a modified version of Davis' (1989) Technology Acceptance Model questionnaire, items Q22-Q42 targeted questions toward participants who reported using technology to progress monitor non-academic IEP goals. As such, Q22-Q30 focused on measuring the tools' perceived usefulness, while Q31-Q42 focused on perceived ease of use. The following table summarizes each item number, survey questions, and associated categories within factors affecting technology adoptions, as identified by Davis (1989) (Table 4.4).

Table 4.4

Perceived Usefulness and Ease of Use Question Items and Categories

	Item Number	Questions	Category
Usefulness			
	Q22	*Using technology-based progress monitoring for functional IEP goals improves the quality of the work I do.*	Quality of Work
	Q23	*Using technology-based progress monitoring for functional IEP goals gives me greater control over my work.*	Control over Work
	Q24	*Technology-based progress monitoring for functional IEP goals enables me to accomplish tasks more quickly.*	Work More Quickly
	Q25	*Technology-based progress monitoring products for functional IEP goals support critical aspects of my job.*	Critical to My Job
	Q26	*Technology-based progress monitoring for functional IEP goals increases my productivity.*	Increase Productivity
	Q27	*Technology-based progress monitoring for functional IEP goals improves my job performance.*	Job Performance
	Q28	*Technology-based progress monitoring for functional IEP goals allows me to accomplish more work than would otherwise be possible.*	Accomplish More Work
	Q29	*Technology-based progress monitoring for functional IEP goals enhances my effectiveness on the job Technology-based progress monitoring for functional IEP goals makes it easier to do my job*	Effectiveness

	Q30	*Overall, I find technology-based progress monitoring for functional IEP goals is useful in my job.*	Makes Job Easier
	Q31		Usefulness
Ease of Use	Q32	*I often become confused when I use technology-based progress monitoring for functional IEP goals.**	Understandable
	Q33	*I make errors frequently when using technology-based progress monitoring for functional IEP goals.**	Effort to Be Skillful
	Q34	*Interacting with technology-based progress monitoring for functional IEP goals is often frustrating.**	Frustrating
	Q35	*I need to consult the user manual often when using technology-based progress monitoring for functional IEP goals.**	Ease of Learning
	Q36	*Interacting with technology-based progress monitoring for functional IEP goals requires a lot of my mental effort.**	Mental Effort
	Q37	*I find it easy to recover from errors encountered while using technology-based progress monitoring for functional IEP goals.*	Effort to be Skillful
	Q38	*Technology-based progress monitoring for functional IEP goals is rigid and inflexible to interact with.**	Rigid & Inflexible
	Q39	*I find it cumbersome to use technology-based progress monitoring for functional IEP goals to do what I want it to do. **	Cumbersome
		Technology-based progress monitoring for functional IEP goals	

	*often behaves in unexpected ways.**	Controllable
Q40	*It is easy for me to remember how to perform tasks using technology-based progress monitoring for functional IEP goals.*	Ease of Remembering
Q41	*Overall, I find technology-based progress monitoring for functional IEP goals easy to use.*	Easy to Use

Note: *Reverse coding was used to display data consistently by ranking statements in agreement with ease of use as *agree* and that contracting ease of use as *disagree*.

Usefulness. Results from survey items pertaining to the overall usefulness of technology-based progress monitoring are summarized in the figure below (Figure 4.3). Of the 57 participants, 39 completed this section of the survey, as they had reported the use of technology for progress monitoring. In total, 92% (35) reported that technology-based progress monitoring is overall useful in their jobs. All of the statements in this area were scored as positive by at least two-thirds of the participants. Technology was rated as useful for the following reasons: : improves quality of work, 85% (33); gives better control over work, 87% (34); provides the ability to work more quickly, 83% (32); is critical to the job, 90% (35); improves job performance, 87% (34); makes it possible to accomplish more work, 74% (28); makes the job easier, 76% (29); and enhances effectiveness on the job, 71% (27).

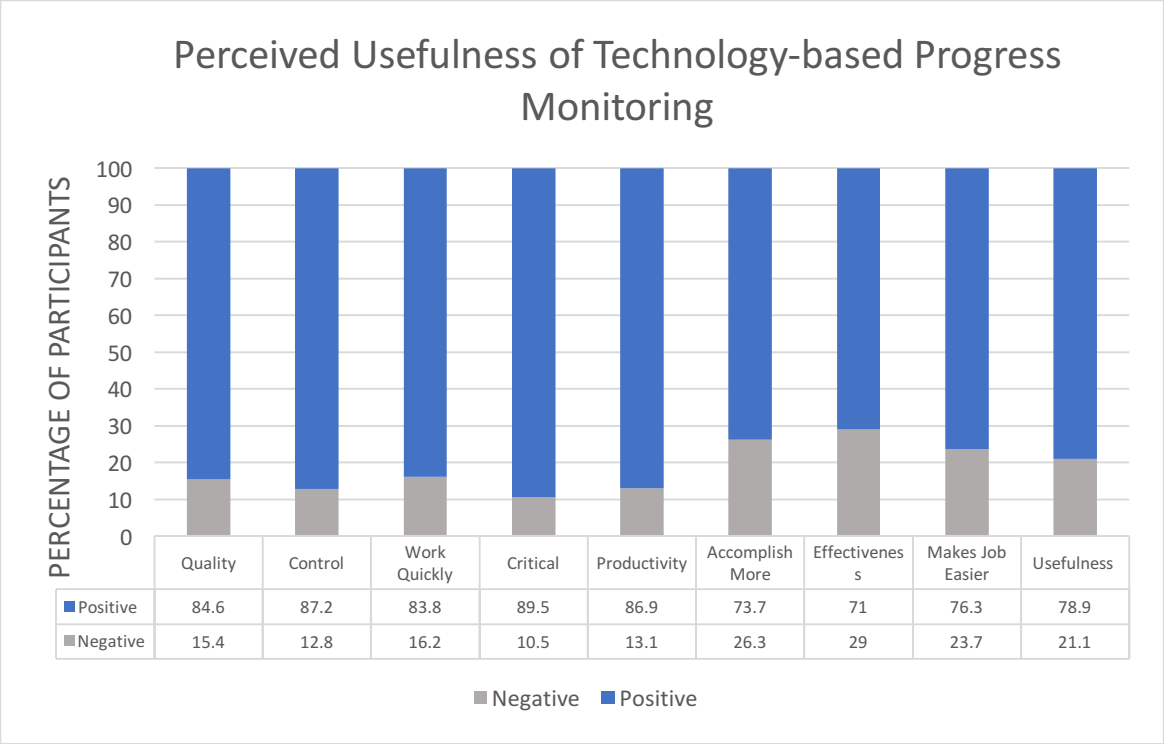

Figure 4.3. Graph of perceived usefulness of technology-based progress monitoring non-academic IEP goals as measured by Davis' (1989) Technology Acceptance Model.

Ease of use. Results from survey items pertaining to the overall ease of use of technology-based progress monitoring is summarized in the figure below (Figure 4.4). Of the 57 participants, 39 completed this section, as they had reported the use of technology for progress monitoring. In total, 84% (*n*=39) reported that technology-based progress monitoring is overall easy to use. In eight of the questions in this section, reverse coding was used to consistently rate responses reflecting positive ease-of-use statements. All measures reflecting the usefulness of this type of progress monitoring yielded at least 70% of participants responding in favor of the ease of use of technology-based progress monitoring. These measures include understandability (79%), gives better control over work (90%), lack of frustration (82%), ease of learning (82%),

ease of recovering from errors (75%), flexible to interact with (76%), predictability (82%), ease of control (75%), and mental effort (74%).

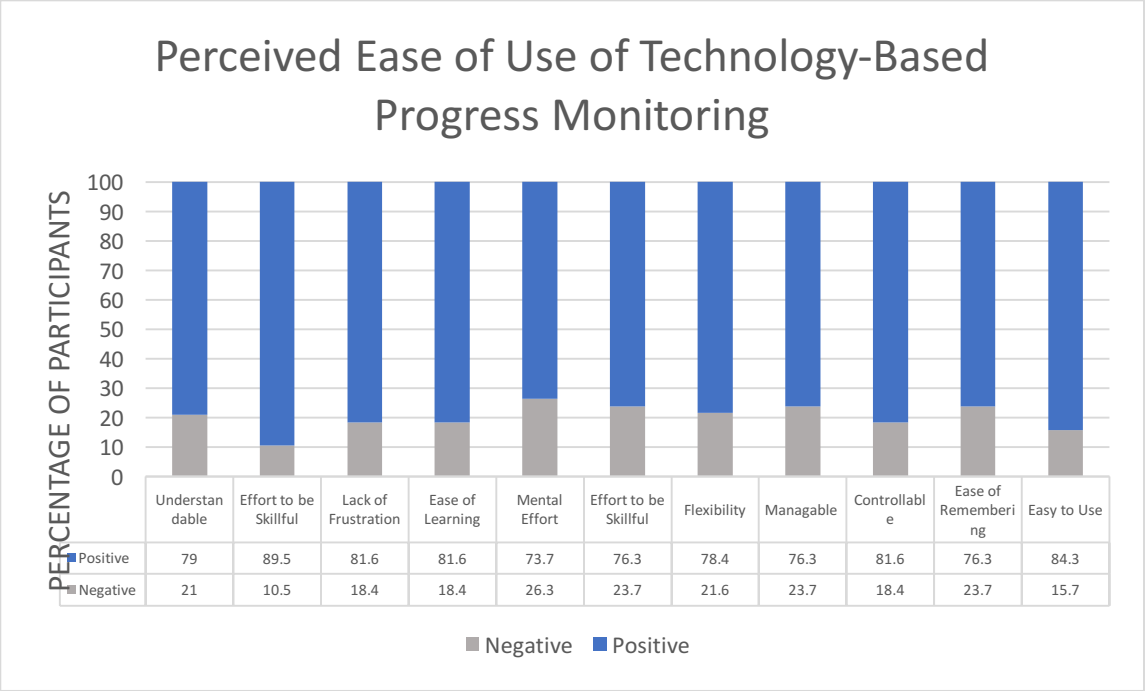

Figure 4.4. Graph of perceived ease of use of technology-based progress monitoring non-academic IEP goals as measured by Davis' (1989) Technology Acceptance Model.

Collectively, participants rated technology-based progress monitoring highly, both in terms of usefulness and ease of use. Davis (1989) determined these factors were key contributing factors to lasting technology implementation. First, perceived usefulness reflects whether a technology tool will help an individual perform better in his or her job. Second, ease of use reflects the end-user's experience with a technology-based tool (Davis, 1989). These factors function in conjunction to predict technology acceptance, not in isolation. As the results from this survey reflect both a positive perception of usefulness and ease of use, it is likely that

technology-based progress monitoring will be accepted by end-users after typical implementation phases.

Qualitative Results

As part of the online survey, participants were asked about the perceived barriers and benefits of using technology-based progress monitoring non-academic IEP goals. Open-ended questions, which required a response, were used to measure these perceptions. Descriptive and in vivo coding were used to determine themes within the participants' responses. Following several rounds of coding, multiple themes emerged. Table 4.5 highlights each theme, frequency of responses, code types, and theme descriptions. The following subsections will summarize and synthesize the coded themes with respect to perceived barriers and benefits of technology-based progress monitoring.

Table 4.5

Frequency and Percentage, Coding Type, and Descriptions of Codes for Perceived Barriers and Benefits of Technology-Based Progress Monitoring Non-Academic IEP Goals (n=57).

Codes	*n* (%)	Type	Description
Perceived Barriers			
Lack of training	15 (26)	In vivo	Issues related to lack of training or professional development
Access to technology	11 (19)	In vivo	Reflects access to technology devices, including desktops, laptops, tablets, or mobile devices
Outdated or inoperable technology	9 (16)	Descriptive	Reflects technology devices that are unable to operate needed programs
Reluctance to change	8 (14)	Descriptive	Notes resistance to added responsibility or trying new technology

Cost	7 (12)	In vivo	Indicates lack of funding or budget constraints
Lack of individualization within technology-based program	5 (9)	Descriptive	Issues with the customization of technology-based progress-monitoring programs
Legal issues in special education	2 (3)	Descriptive	Connections to special education law and due process
Perceived Benefits			
Overall ease of use	24 (42)	Descriptive	Indicates a program is easy to learn and implement
Accessibility	16 (28)	In vivo	Reflects the ability to access data across devices and environment
Organization	16 (28)	In vivo	Indicates improved storage and management
Potential for improved presentation of data	11 (19)	Descriptive	References graphing and display feature of technology-based progress monitoring
Streamlining the progress-monitoring process	9 (16)	In vivo	Reflects a reduction in errors or delays in the progress-monitoring process
Legal issues in special education	2 (3)	Descriptive	Connections to special education law and due process

Note: Percentages do not equal 100%, as participants could choose multiple options.

Perceived Barriers to Using Technology for Progress Monitoring Non-Academic IEP Goals

With respect to survey question Q45, *What barriers do you perceive as affecting the adoption of a technology-enhanced protocol? Why do you believe this?,* teachers reported reasons within the following themes: (1) lack of training, (2) access to technology, (3) outdated or inoperable technology, (4) reluctance to change, (5) cost, (6) lack of individualization within technology-based programs, and (7) legal issues in special education.

Lack of training. Training was the top-reported barrier to implementing technology-based progress-monitoring protocols. In total, 15 participants identified it as a significant barrier. Participant 27 reported, "The lack of training in my school on initiative is a problem," while participant 44 stated, "not having enough training in the program so [I] do not know how to use the technology to the best of my ability." Other classroom staff members, such as personal aides or classroom assistants, were also mentioned by participants, highlighting the difficulty of involving these staff members in data collection if they are not trained. Participant 55 stated, "The only barriers I see is the staff development and time to spend to get things inputted initially. Once things are in it is very simple."

Access to technology. After training, access to technology was reported as a major barrier. Eleven participants identified a lack of resources or access to technology as a problem. Participant 16 reported the lack of "one to one technology for student and teacher" can prevent implementation. In addition to a lack of technology, the quality of the technology available also presented itself as a concern. Nine participants reported old computers, poor Internet connections, and ineffective data-management systems. Teachers indicated there are "glitches in the system" (Participant 17), highlighting "there have been a few instances when the technology

did not work or erased data without saving it. While some of the data was recoverable, some was lost" (Participant 23).

Reluctance to change. Other participants reported a comfort with traditional ways of progress monitoring, a fear of change, or a reluctance to accept additional responsibilities. In total, eight participants highlighted concerns within this theme. For example, some individuals prefer paper-based protocols, as indicated by Participant 10: "I personally am better with data and information when it is on paper in front of me. I prefer to do things by hand." Participants 15 and 31 also saw teachers' lack of technology skills overall as a barrier: "Not all special education teachers are technology experts," and "some teachers are not as fluent or comfortable with technology." Participant 32 further highlighted a resistance to change: "Some teachers are not open to change and will need to see it in action."

Cost. Cost and funding were also recognized by seven participants as barriers. For example, a school may need to purchase more equipment or a specialized program. Participant 34 highlighted that districts may not be willing to pay for these programs, "especially since it's only for a small percentage of students." Participant 49 responded simply, "Money. Money. More money."

Lack of individualization. Another common barrier shared by five participants was the need for individualization. Participant 38 said, "Programs are not easily fitted to every need," while Participant 26 stated, "The problem is each child being individual means there needs to be much, much more flexibility in how goals are written, recorded and analyzed." Others expressed frustration over the lack of customization: "The systems sometimes are rigid and don't have all the information I want to include" (Participant 17).

Legal issues in special education. The final noted barrier concerned legal issues surrounding students with special needs. Participant 33 shared that data can be hacked and progress notes must be kept confidential. Meanwhile, Participant 2 expressed concern over more teacher oversight and accountability: "People are afraid of the legal ramifications […] people do not want to be held accountable and they do not want to be linked to a child with a behavioral issue. Electronic records leave the door more open for teacher monitoring."

Perceived Benefits of Using Technology for Progress Monitoring Non-Academic IEP Goals

After analyzing and coding participant responses to Q45, *What benefits do you perceive as affecting the adoption of a technology-enhanced protocol? Why do you believe this?*, multiple themes arose. With regard to the self-reported benefits of technology-based progress-monitoring systems, the following themes arose: (1) overall ease of use, (2) accessibility, (3) organization, (4) potential for improved presentation of data, (5) streamlining the progress-monitoring process, and (6) legal issues in special education.

Ease of use. The most common perceived benefit of implementing technology-based progress-monitoring protocols for non-academic IEP goals, identified by 24 participants, was reflective of the overall ease of use. Participant 3 noted that technology-based progress monitoring is "quicker and easier once you become fluent with the program." Multiple participants asserted the increased speed of the data-collection process: "The use of technology-based protocol is immediate and can be recorded directly into the system" (Participant 22). Others highlighted the benefit of accessing data across multiple marking periods or years, reflecting student growth, as Participant 25 stated: "Monitoring results are saved and stored and are easy to retrieve. Tech-based programs save the previous results and make it easier to track progress over subsequent monitoring periods." The ease of use can also lend itself to increased

productivity, as it "allows teachers to cover a larger number of students utilizing less time" (Participant 38).

Accessibility. Accessibility was another theme that arose during the coding process. Sixteen participants emphasized technology's ability to be accessed across devices by multiple staff members. Participant 23 stated, "I am able to enter the data anywhere - from my laptop, phone, etc." Participant 15 provided a specific example of staff collaboration on progress monitoring:

> Technology-based protocol for data collecting would be beneficial as it would be easily accessible from multiple locations. For example, if a student was being monitored on their behavior using a computer based protocol, other educators in different locations would have access to include information to the document with minimal time wasted.

Organization. A further noted benefit was increased organization, as compared to traditional paper-based forms of data collection. Sixteen participants noted this perceived advantage. Participant 37 stated, "Data is organized and all in one place," and teachers are "less likely to lose paper information" (Participant 41) Participant 35 said, "It's great to have all of the data in one place that is easily accessible rather than on papers which can get lost in a big pile on my desk. Technology helps me with organization."

As reported by 11 participants, technology-based progress monitoring non-academic IEP goals allows data to be presented more clearly through the use of automated graphs and tables. Overall, it "shows data in a cleaner way" (Participant 49). Participant 10 felt "it is easier to correct mistakes and less time utilized when graphing the concrete data. The fact that technology can calculate formulas to give you the numbers you want makes it easier to graph." Participant 33 asserted, "Built in graphing to determine baseline and expected progress. Great tool to show and explain to parents, functional present level including growth and weakness."

Streamlining process. Nine participants credited technology-based progress monitoring with streamlining the progress-monitoring process consisting of ongoing data collection, data analysis, data reporting, and making programming decisions based on data. One respondent claimed, "It is easier to carry around an iPad and analyze the data in a clear visual way. It reduces the risk of human error in charting and analyzing goals" (Participant 27). Participant 23 continued, "The results are immediately available and easy to analyze when mid-course decisions need to be made." Finally, "it standardizes the collection measures teachers use to progress monitor making it easier for when students move onto different teachers' caseloads" (Participant 15).

Legal issues in special education. Participant 2 claimed legal reasons for increased records and ease of transferring information: "Google based charts would benefit the children and the legality of cases. Instead of copying triplicate piles of paper you could zip a file" which helps create "an ongoing record and tracking is done from year to year." Participant 8 stated that digital progress monitoring can improve "confidentiality" issues in education because information is stored on a secure server.

Summary

Through the use of open-ended questions, participants shared their perceived barriers and benefits to using technology-based progress monitoring on functional IEP goals. Multiple themes arose when analysis participant responses. A lack of training, access to technology, outdated or inoperable technology, cost, a lack of individualization within technology-based programs, reluctance to change, and legal ramifications all were identified as possible barriers to implementing technology. In contrast, overall ease of use, accessibility, organization, potential for improved presentation of data, streamlining the progress-monitoring process, and legality

were seen as benefits to implementing technology to support progress monitoring for non-academic IEP goals.

Chapter Five: Conclusions, Implications, and Recommendations

Introduction

IDEA (2004) asserts the importance of both academic and functional IEP goals. Functional goals are those that help students with disabilities engage in routine daily living skills (Wright & Wright, 2014). As a key component of the IEP, progress-monitoring plans must be included in IEPs to determine growth and the effectiveness and appropriateness of programming. Etscheidt (2006) asserts that progress monitoring is often noted as the least-complied-with IDEA regulation. As such, research aimed at better understanding the progress-monitoring process is needed. While electronic data and technology allowing teachers to make informed instructional decisions to monitor student learning has become common practice for academic content areas, it is unknown how this practice is currently being implemented in special education classrooms where students focus on functional, non-academic goals.

Summary of the Study

The purpose of this mixed-methods study was to determine the current practices and rationales for implementing a technology-based progress monitoring plan focused on non-academic IEP goals. Prior to designing the study, current literature related to this topic was reviewed and summarized in Chapter Two. First, policy and regulations influencing IEP goals and progress monitoring were outlined. Next, a comprehensive summary was provided for current trends in the implementation of progress monitoring for both traditional and technology-based protocols. Finally, factors affecting technology adoption were reviewed.

Following a thorough review of current research, a mixed-methods, non-site-specific study was designed, as outlined in Chapter Three. Quantitative and qualitative data was collected concurrently from 68 participants through an online survey over the course of three weeks. Of

the total participants, 11 responses were removed due to incomplete responses or participants not meeting the criteria set forth in this study. Fifty-seven responses were analyzed using both quantitative and qualitative analysis methods. Descriptive statistics, chi-square testing, descriptive coding, and in vivo coding were used to analyze data to determine answers to the following research questions:

1. What are the characteristics of special education teachers who are using or have used technology-enhanced progress-monitoring protocol plans?
    a. Do internal factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
    b. Do external factors significantly impact teachers' use of technology-enhanced progress monitoring for non-academic goals?
2. What tools are teachers using to implement technology-based progress-monitoring protocols on non-academic IEP goals?
3. Among teachers who report having used technology-enhanced progress-monitoring protocols, what are their perceptions about the usefulness and ease of using technology-based tools?
4. How do teachers perceive barriers and benefits to using technology for progress monitoring for non-academic IEP goals?

Summary of Findings

This study sought to determine the significance of both internal and external factors on technology adoption for progress monitoring non-academic IEP goals. With respect to measured internal factors relating to demographic characteristics, this study found no traits, including age, gender, teaching experience, education level, grade level taught, or population taught, were

associated with an increase in the likelihood of technology adoption for progress monitoring non-academic IEP goals. While some gaps were observed between factors, including age, gender, and grade level taught, these variants were not enough to assign a statistically significant difference. With consideration of factors concerning teaching experience, education level, and population taught, limited variance was measured within the associated populations. Overall, this study found that internal factors do not play a significant role in influencing the likelihood of using technology for progress monitoring non-academic IEP goals.

While demographic factors showed no significant role in technology adoption for progress monitoring non-academic IEP goals, some teacher beliefs influenced its use. Specifically, if a teacher believed that technology-based progress monitoring best met their students' needs, they were likely to use technology in this way. Furthermore, if a teacher believed that technology-based progress monitoring best met teachers' needs, they were highly likely to use technology. Other beliefs associated with traditional forms of progress monitoring or a combination of technology and traditional methods were determined not to play a role in technology adoption.

This study further sought to determine the significance of external factors on technology adoption for progress monitoring non-academic IEP goals. External factors, including school location, SES level, access to technology, technology support, and program-specific technology support were not statistically likely to increase technology use. Conversely, external factors including training on progress monitoring non-academic IEP goals for both traditional and technology-based tools, and encouragement from both school-based administrators and district-level administrators lead to participants being statistically likely to use technology.

Next, of those participants who reported using technology, perceived usefulness and ease of use were measured using questions modified from the TAM questionnaire (Davis, 1989). With respect to perceived usefulness, all measures received positive responses from at least 70% of the participants concerning the tool improving quality of work, giving better control over work, providing the ability to work more quickly, being critical to the job, improving job performance, making it possible to accomplish more work, granting enhanced effectiveness on the job, and making the job easier. In terms of questions regarding ease of use, at least two-thirds of the participants responded positively to questions concerning the following areas: overall ease of use: understandability, effort to be skillful, better control over work, lack of frustration, ease of learning, ease of recovering from errors, flexible to interact with predictability, mental effort required, and ease of control.

Participants reported the use of both traditional and technology-based progress-monitoring tools for non-academic IEP goals. Many tools were popular across both technology- and paper-based formats, including anecdotal notes, checklists, rubrics, and task-analysis reports. Other tools were uniquely linked to technology, including t video or photo portfolios, online surveys or forms, and digital spreadsheets.

Through the use of open-ended questions, participants shared their perceived barriers and benefits to using technology-based progress monitoring on functional IEP goals. Multiple themes arose when analyzing participant responses. A lack of training, access to technology, outdated or inoperable technology, cost, a lack of individualization within technology-based programs, reluctance to change, and legal ramifications were all identified as possible barriers to implementing technology. In contrast, overall ease of use, accessibility, organization, potential for improved presentation of data, streamlining the progress-monitoring process, and legal

compliance were seen as benefits to implementing technology to support progress monitoring non-academic IEP goals.

Conclusions

Factors Impacting Technology Use for Progress Monitoring

Inan and Lowther (2011) report that both internal and external factors regarding individual teachers and school structure can influence technology use. These factors included teachers' demographic characteristics, teachers' beliefs and attitudes, availability and access to computers and resources, and school support structure (Inan & Lowther, 2011). While some of the results of this study further demonstrate the influences of several factors, others were determined not to have a statistically significant impact on technology use for progress monitoring non-academic IEP goals.

Demographics. Previous studies have yielded results that attribute demographic factors to impacting technology used. Prensky (2001) provides the term *digital natives* to reflect individuals that have been born into the digital age.These *digital natives* are assumed to be more comfortable and willing to engage with new technologies (Prensky, 2001). Concerning studies specifically focused on educators, Robinson (2003) and Inan and Lowther (2011) found that both age and teacher experience, which is often linked to age, can impact the use of technology. This study did not produce similar findings. Age and teaching experience were not measured as factors that significantly impacted the use of technology for progress monitoring non-academic IEP goals. This result is positive for school districts and is perhaps reflective of the increased use of technology in general for teachers over recent years.

Concerning gender and teacher education levels, this study confirmed previous findings. Research produced by Sugar et al. (2004) and Waugh (2004) found that gender did not play a

significant role in technology adoption. Sugar et al. (2004) also failed to attribute a teacher's highest level of education to technology adoption. As the population of this study was focused on special education teachers, the responses in these areas were considered in terms of demographics reflective of national statistics. Carlson et al. (2002) report that 85% of all special education teachers in the U.S. are female. The sample in this study was made up of 87% (50) women, thus reflecting the national average. Furthermore, as a master's degree is often required for teacher tenure, many teachers reported a similar level of education. These conclusions are again favorable for school districts and administrators seeking to increase the use of technology-based progress monitoring, as gender and education level are factors outside of their control.

Research considering the use of technology across grade spans and special education placements, including classrooms serving students with both low- and high- incidence disabilities, is sparse. Similar studies concerning the general teacher population demonstrate that there can be variance in teacher technology use, asserting that teachers in departments such as business or science or those in magnet programs are more likely to use technology (Ehrlich et al., 2013; Sugar et al., 2004). While focusing on special education teachers in this study, factors such as grade level taught and student population taught were not determined to influence teacher technology adoption for technology-based progress monitoring for non-academic IEP goals. These conclusions reflect the potential for technology-driven progress monitoring for non-academic IEP goals to be adopted across grade spans and student populations.

This study found that demographic factors did not have a significant influence on technology adoption for progress monitoring. This finding is beneficial to school administrators or districts that plan to implement technology-based progress monitoring, as teacher demographic factors are not within the administration's control. Thus, districts can focus their

efforts on factors within their control to increase the use of technology. Konstantinidis et al. (2013) allude to factors that can increase teacher technology use across all demographic areas, stating that it is no longer possible for teachers to ignore the use of technology because it is a central element in lesson planning, instruction, and student management. This increased use of technology in all aspects of teaching, coupled with meaningful training and supports, districts can increase the use of technology-based progress monitoring.

Teacher beliefs. Hew and Brush (2007) determined that teacher beliefs concerning the influence of technology on teaching and learning can influence a teacher's overall use of technology in the classroom. This study found that teachers who believe technology-based progress monitoring on academic goals best meets students' needs were statistically likely to use technology in this manner. Furthermore, teachers who believe technology-based progress monitoring best meets teachers' needs are highly likely to implement technology-based progress-monitoring protocols. These findings corroborate those of Hew and Brush (2007). While many internal factors such as teacher demographics are not in the control of a school administrator, teacher beliefs can be influenced. School structure, availability of resources, and access to technology can have a positive influence on teacher attitudes and beliefs concerning technology (Hew & Brush, 2007).

External Factors Impacting Technology Use

External factors including school structure, administrative support, access to technology, and available resources can impact teacher technology use (Hew & Brush, 2007; Inan & Lowther, 2011). This study's results found that encouragement from both school-based and district-based administrators can influence technology use for progress monitoring non-academic IEP goals. Furthermore, those teachers who have received training in this area are highly likely

to use technology for this purpose. In the areas of training and support, the results align with previous research conducted by Hew and Brush (2007) and Inan and Lowther (2011).

Other external factors measured were found not to have a significant impact on technology use. Conversely to previous findings by Inan and Lowther (2011), school location and SES level did not impact technology use. This study further asserted that resources and access to technology are not equally dispersed across schools, leaving urban and low-income schools at a disadvantage. Despite location or self-reported student SES level, only 14% (8) of participants reported having limited access to technology. Overall, contradictory to previous findings, this lack of access did not have an impact of technology use. However, one notable reported barrier relating to technology access referred to the age of the technology provided. It is evident that teachers are generally provided with technology, yet these tools are not updated or the most effective tools.

Participants who were provided with technology-based programs and technology-based support were also not statistically more likely to use technology for progress monitoring. This finding again opposes previous research (Hew & Brush, 2007). The results of this study reflect that simply providing a tool does not encourage its use. Furthermore, ongoing technology-based support does not impact the use of technology for progress monitoring on non-academic growth.

Current Practices in the Field

Overall use. According to Goldstein and Behuniak (2012), no standardized progress-monitoring protocol using technology has been adopted to meet the needs of students with disabilities focused on increasing non-academic skills. Despite this assertion, this study found that 68% (39) of participants reported using technology to progress monitor non-academic IEP goals. While this result does not mirror the mass adoption of technology-based progress

monitoring on academic goals encouraged by RTI, as highlighted by Zirkel and Thomas (2010), these findings are promising and show growth in technology-based data collection in non-academic areas.

Goldstein and Behuniak (2012) further assert that teachers are not provided with progress-monitoring tools. Instead, teachers are often left to create their own systems for progress monitoring (Luze & Peterson, 2004). Forty-five percent (26) of this study's participants asserted that their districts do not provide them with traditional, paper-based progress-monitoring protocols for non-academic IEP goals. Furthermore, 39% (22) were not provided with technology-based progress-monitoring tools by their district. These results reflect that a large portion of those surveyed are provided with few resources in this area, leading to teachers creating their own progress-monitoring programs. In addition, 36% (21) of participants reported not receiving any training on progress monitoring non-academic IEP goals. This lack of training, combined with a lack of progress-monitoring resources, can contribute to progress monitoring being the least-complied-with IDEA IEP component, as IEP teams fail to develop and implement plans that yield meaningful data (Etscheidt, 2006). In the wake of *Endrew F. v. Douglas County* (2017), districts must refocus their efforts and resources to provide "an educational program reasonably calculated to enable a child to make progress appropriate in light of the child's circumstances" (p. 14-15).

Traditional versus technology-based tools. In terms of the tools being used to progress monitor student growth, many teachers reported using technology tools in a similar manner as paper-based progress-monitoring protocols. For example, the two most popular tools, both paper-based and technology-based, were checklists and anecdotal notes. While converting these paper-

based tools to technology-based tools can improve recordkeeping, its implementation does not reflect an innovative use of technology that incorporates improved data analysis and reporting.

Other participants reported the use of technology-based tools that reflect practices that incorporated the benefits technology can offer. For examples, digital surveys through tools such as Google Forms, used by 38% (22) of participants, can be shared with other staff members and increase collaboration. Spreadsheet-based software, including Microsoft Excel and Google Sheets, was used by 7% (4) of participants, who reported better data analysis and easier reporting through the use of graphs and tables.

A small number of participants used technology-based tools in a more innovative manner that helped ensure the authenticity of the progress monitoring. Deno (2003) and Stockall et al. (2014) suggest the use of digital portfolios to provide a collection of artifacts that can depict a student's level of performance on a task or skill. Ten percent (6) of the participants reported the use of picture-based digital portfolios, while 4% (2) reported the use of video-based progress-monitoring portfolios. Although the percentage of participants using these tools is low, the presence of these innovative practices is encouraging to the field of special education.

One area of concern was respondents' reports that they use case-management software as a progress-monitoring tool. These systems, such as EASY IEP, IEP Plus, and REALTIME, allow teachers to summarize progress in order to report this information. However, they do not offer data-collection tools that produce meaningful data reflective of a defendable progress-monitoring system. Peacock et al. (2010) outlined the key elements to be included in progress monitoring on functional IEP goals, including frequent and ongoing probes, the ability to track students' performance at their levels of independence, and providing summative data through the use of charts or graphs connecting progress monitoring to instruction.

Technology Acceptance Model Results

Davis's (1989) Technology Acceptance Model was designed to measure factors than can influence a user's decision to adopt a specific technology. Perceived usefulness reflects the degree to which a person feels a technology-based system will enhance his or her job performance. Perceived ease of use relates to the degree to which a person believes a technology-based system will be free from effort (Davis, 1989). This study's results determined that at least two-thirds of the 39 participants who reported using technology scored technology-based progress monitoring positively in terms of usefulness and ease of use. This finding implies that a technology-based progress-monitoring protocol is likely to be adopted by end-users after initial use. These initial results align with previous studies concerning teacher technology use in K-12 schools (Inan & Lowther, 2011; Robinson, 2003; Teo, 2012).

These results were also reflected in qualitative responses concerning perceived barriers. Participant 12 reported that the initial use of a program is a barrier. After this first use, however, participants reported overall positive interactions and claimed that technology-based progress monitoring was quick and easy, thus encouraging its use. These results are positive, as participants who reported the implementation of technology-based progress monitoring are likely to continue its use and new users are likely to adopt its use due to its reported ease of use and usefulness to special education teachers.

Perceived Benefits and Barriers

It is evident that special education teachers perceive benefits in implementing technology-based progress-monitoring protocols that align with research-based practices. Overall, it can increase productivity. Effective progress-monitoring plans, as Huberman et al. (2012) note, is a continuous and ongoing process. By increasing productivity, teachers can

collect data more often, providing more thorough and accurate evaluations of student progress. Additionally, this process helps teachers meet the demands placed on them by IDEA (Vannest et al., 2011).

Technology-based progress monitoring also provides participants better opportunities for collaboration with colleagues. Konstantinidis et al. (2013) recognize technology as increasing collaboration to ensure that all necessary parties are involved in data collection, ensuring that they take an active role in student progress. As a progress-monitoring plan is to be developed by an IEP team, it is only fitting that the team is also involved in ongoing data collection. Through increased collaboration using technology-based progress monitoring, a team-based progress-monitoring plan becomes achievable.

According to IDEA, student progress must be shared with parents at least alongside report cards. Not all forms of data are appropriate to share with parents – for example, a large collection of anecdotal notes or raw data that has not been synthesized. Participant 39 said technology-based progress monitoring makes it easier to share progress with parents, as data can be presented clearly through graphs. Bausch and Ault (2013) encourage the use of technology for progress monitoring because it can automate data analysis and produce data graphs that would not otherwise be possible.

Finally, participants recognized the benefit of improved recordkeeping. Data can be saved from year to year and reviewed as needed. Multiple participants stated that they had lost paper documents over time and technology-based protocols mitigate that possibility. Meller (2011) concludes that technology can help solve many of the problems plaguing special education, including poor recordkeeping. With improved storage, districts can provide a more accurate picture of student growth without relying on paper-based files that can be misplaced.

Participants also agreed on barriers that can prevent the implementation of technology. These results most aligned with previous research conducted by Hew and Brush (2007) and Inan and Lowther (2011); however, some new barriers arose from participant responses. The most reported barrier was training. Twenty-six percent (15) of participants identified this area as a major barrier. Considering quantitative data found that specific training in technology-based progress monitoring highly impacted the use of technology, it is evident that training can be a critical factor in teachers' use of technology for progress monitoring.

Similar to Hew and Brush's (2007) findings, participants also perceived access to technology as a barrier. However, an additional barrier arose concerning the age and overall effectiveness of outdated technology. Other participants cited cost as a major barrier. While availability of technology is an often-cited source of challenges to technology use (Inan & Lowther, 2011), cost alone is a challenge that plagues school districts, as budgets are tied to public funds.

Participants noted the need for systems to be more flexible in order to design individualized data-collection systems. Di Rezze et al. (2008) stress the importance of individualized, multidimensional IEP goals, instructional strategies, and progress-monitoring plans for students with disabilities focusing on functional skills. To address this previously noted challenge, teachers design their own progress-monitoring plans (Goldstein & Behuniak, 2012). However, with advances in technology, participants seek more customization within technology-based systems to help improve the design of teacher-made probes and assessments. Stocktall et al. (2014) note that a lack of a quality system that meets individual needs leads to a lack of continuity in a child's program and affects his or her overall potential for growth.

Participants all noted that they may be reluctant to try a new way of doing things. One final notable barrier concerns teacher efficacy. Vannest and Hagan-Burke (2010) outline the work responsibilities of a special education teacher, and time delegated to paperwork and assessment are limited. Coupled with other responsibilities such as instruction, behavioral support, and consultation, special education teachers often feel overworked. While participants in this study noted a reluctance to change, the benefits highlighted can help alleviate some of the time constraints placed upon teachers by providing a system that support effective and efficient data collection and analysis.

A final concern, which was listed as both a barrier and a benefit, concerns the legal issues surrounding special education. Etscheidt (2007) identifies progress monitoring as the least-complied-with IDEA regulation. One participant discussed the ease of transferring data and information about student progress after a due process case is filed, claiming that information can be sent in a zip file, saving time and paper. While this benefit was noted, Participant 2 stated that teachers do not want to be associated with a child over a long period of time after completing services. Digital documents produce a permanent record that will follow students and teachers. Hew and Brush (2007) highlight teacher efficacy around learning and using new technology; however, self-efficacy concerning specific job duties is not exposed as a barrier to technology use.

Many of the barriers and benefits to technology integration for progress monitoring non-academic IEP goals mirror pervious finds, both in the field of technology and specifically within special education (Etscheidt, 2007; Goldstein & Behuniak, 2012; Hew & Brush, 2007; Inan & Lowther, 2011). Some new barriers were unveiled in this study, including the age of technology, the need for system individualization, and a desire for job-related self-efficacy. The benefits of

technology-based progress monitoring highlighted by participants, along with the noted power of specific training, are encouraging for the field and the increased adoption of technology-based progress monitoring.

Implications

This section summarizes implications of this research based on the results and conclusions drawn. These recommendations can be divided into the following three areas. First, implications for IEP teams are made. Next, recommendations for schools and districts are presented. Finally, recommendations for improving technology-based progress-monitoring tools are made.

Recommendations for IEP Teams

The first recommendation for IEP teams is to consider using a technology-based progress-monitoring program for non-academic goals. Based on the results of this study, after technology-based progress-monitoring plans have been implemented, teachers generally find it easier to collect, manage, synthesize, and report data on student growth. Notwithstanding, the reluctance to engage with a new technology tool is common among new users. However, based on the results of the Technology Acceptance Model portion of this survey, users of technology-based progress monitoring report that these tools are critical to their job and overall easy to use once the initial learning curve is passed. This process can be supported through school structure and professional development, which is elaborated on in the recommendations to school districts. However, if these supports are not provided, a dedicated IEP team can work collaboratively to develop and facilitate technology-based progress monitoring.

The second recommendation for IEP teams is to ensure that meaningful and legally defensible progress-monitoring plans are developed and implemented for each of a student's IEP

goals. In order to meet this mandate more effectively, IEP teams must become proactive in developing progress-monitoring plans to determine how data is being collected, by whom, and how often. While this challenge falls on the IEP team, the ultimate responsibility often lies with the special education teacher managing the case. This study's results reflect a lack of understanding for some participants concerning the complete progress-monitoring process. For example, some participants reported only using case-management software that is used to summarize and report data. This step, however, does not address ongoing data collection reflecting a student's level of independence. In order to best meet students' instructional needs, justifying programming decisions, and demonstrating growth, progress monitoring must include all of the following elements outlined by Peacock et al. (2010): frequent, ongoing probes; the ability to track student performance based on level of independence; and the ability to summarize data through the use of charts or graphs to connect data to instruction. If progress-monitoring plans are developed by the IEP team during collaborative planning sessions or meetings, it can be ensured that these vital elements are included within selected or developed progress-monitoring tools, making it easier for a teacher to collect meaningful data.

The final recommendation for IEP teams is to engage in training in the area of technology-based progress monitoring non-academic goals. Many educators are often able to select training sessions or develop personalized professional growth plans. As this topic is only relevant to special education, many districts may overlook the need for training in this area. As such, it may be in an IEP team's best interest to receive training in this area, especially if they directly focus on the instruction of functional skills, such as life skills, behavior, executive functioning skills, vocational goals, and social skills.

Recommendations for School Districts

The paramount recommendation for school districts and administrators based on this body of research is to begin to focus more on the functional needs of students with disabilities. While these students do not represent a large percent of the total student body, it is imperative that school districts, administrators, and teachers provide programs that allow all students to make progress on challenging objectives. *Endrew F. v. Douglas County SD* (2017) demands that districts provide programs that promote reasonable progress with respect to student circumstances. It is essential for districts to develop standards and unified expectations for progress monitoring non-academic skills. While this process could be done through the use of traditional, paper-based tools, technology provides a more effective and efficient means of collecting data.

Once a standard is defined and established, districts must assert the use of approved tools with special education teachers. When asked if teachers felt encouraged by school districts to use technology-based progress monitoring, only 60% (n=34) of participants agreed. Technology-based monitoring for academic goals has become a common standard; however, it is evident that districts are not placing the same expectations on functional skills.

Furthermore, in light of the new standard established by *Endrew F. v Douglas County SD* (2017), districts should consider standardizing their progress-monitoring process and expectations for non-academic, functional IEP goals. This process could involve setting a minimum number of data points to be collected before reporting. Additionally, districts should consider purchasing and providing training on a technology-driven progress-monitoring platform that addresses functional skills. While technology-based protocols alone do not meet the standards set in the recent Supreme Court ruling, they provide a streamlined, more efficient

process encouraging the collection of meaningful data, as noted in the perceived benefits uncovered in this study.

The next recommendation for school districts is to provide training for special education teachers in this area. As teachers who receive training are highly likely to use technology to progress monitor non-academic IEP goals, training is a way to increase technology use. Furthermore, this study's results determined that teachers who are provided with technology-based progress-monitoring tools are not statistically more likely to use them. While it appears districts have invested in tools for progress monitoring, without training, those tools may not be put to appropriate use. It is evident that training is the key to large-scale implementation of technology-based progress monitoring.

Not only is training important for implementation purposes, but it also has the ability to shape or change teachers' beliefs concerning technology. Consideration should be given to the quality and delivery of technology-based training. Furthermore, this study found that teachers are likely to adopt a progress-monitoring tool if they feel it best meets their students' needs. Notwithstanding, teachers were even more likely to use technology-based progress monitoring if they believed this tool best meets teachers' needs. In consideration of these findings, school districts should consider how new technologies are introduced and advertised to teachers. If teachers believe a tool will better serve them, they could be more likely to adopt it.

Another recommendation made to districts based on this study's results is for administrators to encourage the use of technology-based tools for progress monitoring. Both school-based and district-based encouragement are linked to the usage of technology-based protocols. This recommendation could lead school districts to develop policies for teachers requiring the use of technology-based progress monitoring. Additionally, districts can develop

plans for administrators to monitor teacher implementation of progress-monitoring plans for non-academic IEP goals, as this area is often overlooked by administrators.

The final recommendation for school districts is to consider assessing the age and effectiveness of current technology tools in schools. As technology has been widely adopted in K-12 education, many classrooms are equipped with computers and other devices. Despite this access, the effective use of these technologies is limited due to issues including slow processors, limited memory, or poor Internet connections. When making purchasing decisions for technology, districts must consider the estimated life of a tool and the cost of maintaining or upgrading technology as needed. As technology is required more and more in the classroom, districts must ensure that teachers have access to up-to-date technology tools that allow them to complete required tasks.

Recommendations for Technology Tool Improvement

While teachers who reported the use of customizable tools such as Google Forms, Excel, and digital portfolios were satisfied with the current state of individualization, other users who relied on programs such as behavior-tracking applications or district-provided software such as AIMSWeb reported a lack of customization to meet student needs. Often functional, non-academic IEP goals are individualized and specifically address aspects unique to a child. As such, teachers would like data-tracking software to reflect this need. It is recommended that software companies that specialize in tracking student growth consider providing users with the ability to measure student growth for functional skills. This ability will allow quality progress monitoring for all students in all areas.

Recommendations for Future Research

In addition to the aforementioned implications, the results and conclusions made in this study have uncovered gaps within current research literature concerning technology-based progress monitoring. The following suggestions for future research may produce results and conclusions that expand beyond the realm of technology-based progress monitoring, as they can provide deeper knowledge on areas that can affect more special education practices and K-12 education at large.

It is first recommended that a similar study is conducted regarding current practices and perceptions of special education teachers on technology-based progress monitoring for non-academic IEP goals. In addition to survey collection, interviews should be implemented to gain the perspective of participants less inclined to use technology who may be hesitant to participant in online surveys. Furthermore, a larger sample size should be accessed in order to increase the level of confidence for the study and decrease the margin of error. A vast sample population will enhance the generalizability of the results, leading to further recommendations within the field of special education.

Research should be conducted that specifically examines the impact of training on the adoption of technology-based tools. This study found that if teachers were provided with training in technology-based progress monitoring, they were highly likely to use technology-based tools. A thorough investigation into the relationship of the type and quality of training provided and technology use can provide insight into the future development of effective educational trainings.

Next, this study uncovered aging technology as a barrier to implementing technology tools in new ways. It is recommended that a study be conducted to assess the overall age, quality,

and effectiveness of school-based technologies in urban, rural, and suburban school districts. These results can provide insight for districts when making future technology purchases.

As this study solely focused on the impact of technology for progress monitoring for non-academic goals, it did not provide a deepened understanding into the quality of progress-monitoring plans implemented by teachers. While previous research has outlined the elements needed for meaningful progress-monitoring systems, it is unknown if special education teachers include all necessary aspects into their plans. A thorough study is recommended to investigate the complete progress-monitoring process, including how progress-monitoring plans are developed, how often teachers collect data, how data is analyzed, and how results are reported to parents.

A final recommendation for future research concerns the notion of legally defensible progress monitoring. While this term has been used in previous research and throughout this study, a universally agreed-upon standard has not been developed. A body of research has not been presented representing the views of teachers, parents, districts, solicitors, and special education hearing officers. A study examining the views of the above parties is recommended in order to provide guidelines for best practices concerning legally defensible progress monitoring. This step will also support school districts as they form new policies to address the new standards set in *Endrew F. v. Douglas County SD* (2017). This question will surely be litigated in future cases and districts must monitor future decisions for guidance or risk non-compliance leading to their own litigation, which drains district resources.

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Appendix A

Survey Protocol

Teacher Practices and Perceptions on Technology-based

Progress Monitoring for Non-Academic IEP Goals

Using the following scale, to what extend do you agree with each statement (1- Strongly Disagree, 2-Disagree, 3-Agree, 4-Strongly Agree).

1. I collect data through progress monitoring to track student growth on non-academic tasks.
2. I collect data through progress monitoring to make informed instructional decision while teaching non-academic skills.
3. I have received training in progress monitoring for functional, non-academic IEP goals.
4. I have received training on how to use technology-based tools to progress monitor functional, non-academic IEP goals.
5. My school based administration encourages the use of technology to collect, analyze and report data for progress monitoring for non-academic IEP goals?
6. My district encourages the use of technology to collect, analyze and report data for progress monitoring non-academic IEP goals?
7. I am provided with paper based tools to collect, analyze and report on progress monitoring.
8. I am provided with technology-based tools to collect, analyze and report on progress monitoring.
9. Technology, including but not limited to, computers, laptops and/or tablets, is readily available at my school.
10. Technology-based support is provided to remedy any technical technology issues.

11. Technology-based support is provided to remedy program specific technology issues.
12. I believe paper based progress monitoring best meets the needs of students focused on improving non-academic skills.
13. I believe paper based progress monitoring best meets the needs of teachers focused on improving non-academic skills.
14. I believe technology-based progress monitoring best meets the needs of students focused on improving non-academic skills.
15. I believe technology-based progress monitoring best meets the needs of teachers focused on improving non-academic skills.
16. I believe both paper and technology-based progress monitoring best meets the needs of students focused on improving non-academic skills.
17. I believe both paper and technology-based progress monitoring best meets the needs of teachers focused on improving non-academic skills.

Multiple Choice

18. What traditional tools do you use to assess student progress on non-academic, functional goals: (checklist with open boxes to list other methods)
    a. Paper based checklists
    b. Paper based task analysis
    c. Paper based rubrics
    d. Paper based anecdotal notes
    e. School district/organization provided paper data collection sheets
    f. Other (list)

19. What technology-based tools do you use to assess student progress on non-academic, functional goals: (checklist with open boxes to list other methods)
    a. Digital checklist
    b. Digital task analysis
    c. Digital survey
    d. Digital anecdotal notes
    e. Digital portfolio (photo based)
    f. Digital portfolio (video based)
    g. Technology-based program (list)
    h. App specific tracking (list)
    i. Other (list)
20. I have used paper based or traditional methods to monitor the progress of functional IEP goals.
    a. Have used
    b. Never used
21. I have used technology to monitor the progress functional IEP goals.
    a. Have used
    b. Never used (directed to open ended and demographic questions)

Using the following scale, to what extend do you agree with each statement (1- Strongly Disagree, 2-Disagree, 3-Agree, 4-Strongly Agree) ***Revised from the Technology Acceptance Model Questionnaire (Davis, 1989).***

22. Using technology-based progress monitoring for functional IEP goals improves the quality of the work I do.

23. Using technology-based progress monitoring for functional IEP goals gives me greater control over my work.
24. Technology-based progress monitoring for functional IEP goals enables me to accomplish tasks more quickly.
25. Technology-based progress monitoring products for functional IEP goals support critical aspects of my job.
26. Technology-based progress monitoring for functional IEP goals increases my productivity.
27. Technology-based progress monitoring for functional IEP goals improves my job performance.
28. Technology-based progress monitoring for functional IEP goals allows me to accomplish more work than would otherwise be possible.
29. Technology-based progress monitoring for functional IEP goals enhances my effectiveness on the job
30. Technology-based progress monitoring for functional IEP goals makes it easier to do my job
31. Overall, I find technology-based progress monitoring for functional IEP goals is useful in my job.
32. I often become confused when I use technology-based progress monitoring for functional IEP goals.
33. I make errors frequently when using technology-based progress monitoring for functional IEP goals.

34. Interacting with technology-based progress monitoring for functional IEP goals is often frustrating.
35. I need to consult the user manual often when using technology-based progress monitoring for functional IEP goals.
36. Interacting with technology-based progress monitoring for functional IEP goals requires a lot of my mental effort.
37. I find it easy to recover from errors encountered while using technology-based progress monitoring for functional IEP goals.
38. Technology-based progress monitoring for functional IEP goals is rigid and inflexible to interact with.
39. I find it cumbersome to use technology-based progress monitoring for functional IEP goals to do what I want it to do.
40. Technology-based progress monitoring for functional IEP goals often behaves in unexpected ways.
41. It is easy for me to remember how to perform tasks using technology-based progress monitoring for functional IEP goals.
42. Overall, I find technology-based progress monitoring for functional IEP goals easy to use.

Open Ended

43. What are your perceived benefits of implementing a technology-based protocol for data collection on non-academic IEP goals? Why do you believe this?
44. What barriers do you perceive as affecting the adoption of a technology-enhanced protocol? Why do you believe this?

School Demographics

45. How would you describe your school?
    a. Public
    b. Charter
    c. Parochial
    d. Private
    e. Cross District
46. How would you describe your school's location?
    a. Urban
    b. Suburban
    c. Rural
47. What percentage of students receive free and reduced lunch (drop down by 10% levels)

Personal Demographics

48. How would you describe you Special Education teacher role?
    a. General Education Support/Co-Teacher
    b. Learning Support/Resource
    c. Autistic Support
    d. Emotional Support
    e. Life Skills Support
    f. Multiple Disabilities Support
    g. Other (list)
49. What best describes the grades level you teach (drop down)
    a. Early Intervention (age 3-5)

b. Kindergarten to Grade 2

c. Grades 3-5

d. Grades 6-8

e. Grades 9-12

f. Ages 18-21

50. Gender

a. Male

b. Female

51. Age

a. (drop down)

52. Teaching Experience (including this school year)

a. (drop down)

53. Education Level

a. Bachelor's Degree

b. Master's Degree

c. Master's Degree + Additional college credits

d. Doctorate Degree (EdD or PhD)

54. Ethnicity/race (census data)

a. American Indian or Alaska Native

b. Asian

c. Black or African American

d. Hispanic or Latino

e. Native Hawaiian or Other Pacific Islander

f. White

Appendix B

Drexel University

Consent to Take Part in a Research Study

1. *Title of research study:* Technology's Role in Progress Monitoring Non-Academic Individual Education Program (IEP) Goals

2. *Researcher:* Alicia M. Drelick and Toni Sondergeld

3. *Why you are being invited to take part in a research study?*

We invite you to take part in a research study because you are special education teacher who services students with non-academic IEP goals, including but not limited to life skills, executive functioning skills, vocational goals and social skills.

4. *What you should know about a research study?*

- Someone will explain this research study to you.
- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part now and change your mind later.
- If you decide to not be a part of this research no one will hold it against you.
- Feel free to ask all the questions you want before you decide.

5. *Who can you talk to about this research study?*

If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team, Toni Sondergeld (tas365@drexel.edu) or Alicia Drelick (amd464@drexel.edu)

This research has been reviewed and approved by an Institutional Review Board (IRB).

An IRB reviews research projects so that steps are taken to protect the rights and welfare of humans subjects taking part in the research.

You may talk to them at (215) 762-3944 or email HRPP@drexel.edu for any of the following:

- Your questions, concerns, or complaints are not being answered by the research team
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research subject.
- You want to get information or provide input about this research.

6. *Why is this research being done?*

The purpose of this mixed methods study is to determine the current practices and rationale for implementing a technology-based progress monitoring plan focused on non-academic IEP goals. The results of this study will provide insight into how teachers are implementing technology-based protocols for progress monitoring non-academic goals. This can produce a clearer picture into practices utilized in the field. Thus, further research can be conducted to examine new best practices that can produce legally defensible and meaningful progress monitoring, while addressing the paperwork reduction clause within IDEA.

7. *How long will the research last?*

The estimated time to complete the online survey is about 20-30 minutes. Once a participant has completed the survey, their participation in the study is complete. A

testing window will be open for three weeks. Participates may complete the survey at any time during this window.

8. *How many people will be studied?*

We expect about 80 people here will be in this research study out of 300 people in the entire study.

9. *What happens if I say yes, I want to be in this research?*

You will complete an online survey on Qualtrics which is estimated to take between 20-30 minutes. Questions contain multiple choice and open ended items. The survey can be taken any time during the three-week data collection window. Upon survey submission, participants will have completed all the participation requirements.

10. *What are my responsibilities if I take part in this research?*

If you take part in this research, it is very important that you"

- Follow the investigator's or researcher's instructions.
- Tell the investigator or researcher right away if you have a complication or injury.
- Complete the survey honestly.
- Answer all the questions outline in the survey.

11. *What happens if I do not want to be in this research?*

You may decide not to take part in the research and it will not be held against you.

Please disregard any emails during the data collection window.

12. *What happens if I say yes, but I change my mind later?*

If you agree to take part in the research now, you can stop at any time it will not be held

against you. Please discontinue the survey. Any collected data previously collected data will be analyzed by the researcher. As there is not identifying information collected, individual data entries cannot be removed from the database.

13. *Is there any way being in this study could be bad for me?*

There are no inherent risk associated with participating in this study.

14. *Do I have to pay for anything while I am on this study?*

There is no cost to you for participating in this study.

15. *Will being in this study help me in any way?*

There are no benefits to you from your taking part in this research. We cannot promise any benefits to others from your taking part in this research.

16. *What happens to the information we collect?*

Efforts will be made to limit access to your personal information including research study records, to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of this organization. We may publish the results of this research. However, we will keep your name and other identifying information confidential.

17. *What else do I need to know?*

This research is conducted by a researcher who is a member of Drexel University.